KNOWLEDGE
AN
ILLUSTRATED MAGAZINE
OF
SCIENCE, LITERATURE, & ART

LONDON: JULY 1, 1886.

THE UNKNOWABLE.

By Richard A. Proctor.

WORSHIP OF THE HEAVENLY BODIES.

(*Continued from page* 235.)

IT is not necessary, however, to consider the indirect evidence derivable from Hebrew literature to recognise the way in which in early ages the heavenly bodies were worshipped. We have direct evidence sufficiently decisive to leave no manner of doubt on this point. I do not here refer to the astrological ideas of ancient races, clearly though these show that men regarded the heavenly bodies as influencing the fates and fortunes of men, and therefore as deities. The evidence derived from the direct association of astronomical observations with religion is more significant still, though scarcely more decisive. When we find that ceremonies manifestly relating to the religion of a people were conducted with special reference to the movements of the heavenly bodies, that structures as manifestly connected with religion were employed for astronomical observations of various kinds, that even the fears and aspirations of men with regard to a future life were associated with the movements of the heavenly bodies, we cannot doubt that the sun and moon, the planets and the stars, were the objects of religious veneration.

There may be reason to question the astronomical significance of many among the structures whose ruins are found in Egypt, Assyria, Mexico, Peru, and elsewhere; yet we find among them many so obviously astronomical in character while yet so obviously religious that they would suffice to establish the connexion between religion and astronomy in those ancient days when the movements of the heavenly bodies were unexplained and seemed inexplicable. It is, however, when we turn to the pyramids of Egypt that all doubt is finally dispelled, and that we are thus enabled to turn to other structures which, considered by themselves, had seemed to give less satisfactory evidence, and accept in turn what these also teach.

I am not concerned that many Egyptologists deny the astronomical character of the pyramids, because on this point the opinion of Egyptologists is worth very little unless they happen to be also astronomers. No astronomer acquainted with the evidence can for a moment doubt that all the pyramids of Ghizeh were oriented astronomically, or that, at any rate, while this process was in progress—that is, while the building was being raised from base to mid-height—each pyramid was in fact an astronomical observatory. Of course, an astronomer may believe, if he likes, that though thus of necessity an observatory (even that it might be built of the desired shape and in the desired position) the Great Pyramid, or any of its fellows, was by no means an observatory for any other purpose. So any one observing that a telescope was mounted equatorially in so exact and perfect a way as to show that its own magnifying power must have been employed to secure the accuracy of its adjustment, might nevertheless assume, if he liked, that that was the sole end for which the telescope had been employed. The power which some men, even among astronomers, have for adopting unlikely explanations, where simpler ones are obviously suggested by the evidence, must be admitted, since it has been repeatedly manifested in surprising ways. It may be admitted as a conceivable, however unlikely, thought that men took an immense amount of trouble to make the Great Pyramid a perfect observatory for no other purpose than that they might square and orient the building as such a building would have had to be oriented in order that it might be a perfect observatory. As we can imagine no other purpose which the exact adjustment of the building in astronomical respects could possibly fulfil than that it should fulfil astronomical relations and be available for carrying out special astronomical work (of *some* sort), the theory that the exact adjustment was arranged only that the adjustment might be exact, and with no further end in view, will always delight a certain order of minds. But even so, we have at least this fact obvious to every astronomer, that the pyramids, and especially the Great Pyramid, must for a time have been astronomical observatories, even were it only that they might be built on the plan to which they unquestionably correspond.

So much is certain, let Lepsius and all other non-astronomical Egyptologists say what they will, leaving their own department to talk of what they do not understand. But let not us fall into their mistake, however, but accept their opinion unhesitatingly when they speak with one accord of what they do understand. It is as idle for the astronomer to deny that the pyramids are one and all tombs, as it is for the Egyptologist to deny their astronomical character. Of course, a paradoxical enthusiast may entertain the theory that an exception is to be made in the case of the great pyramid, and find even the sarcophagus in its interior to be no sarcophagus at all, but only a measure of capacity, stored where it could never be seen, and where, as a matter of fact, it was not understood until it was no longer in such a state that its capacity could be measured. It would be enough that the Egyptologist, here on his own ground, asserts this view to be utterly untenable, and that the Great Pyramid was unquestionably a tomb, to overthrow the theory absolutely, even if it were probable in itself; but in reality it is antecedently improbable, and is supported by no evidence of the least weight.

Finding, then, that the pyramids were certainly astronomical, and were as certainly tombs, we may infer with full confidence that they were temples especially intended for such ceremonial observances as belong to the worship of the heavenly bodies. For, on the one hand, astronomy meant in those days the worship of the host of heaven with astrological observances for the ceremonial of that Sabaistic religion; and, on the other hand, the tombs of the ancient Egyptians were as altars during the lifetime of their future tenants, and all the ideas connected with the entombment of the body were associated with religions. The pyramids were altars set in the midst of the vast temple whose roof is the star-lit sky; and within that temple the gods themselves, sun and moon and planets and stars, were ever present.

I would not be understood to assert here that all pyramidal structures were astronomical in plan and purpose. On the contrary, I recognise the justice of the opinion maintained by archæologists (and especially by students of Egyptian archæology), that pyramids were originally *mere* tombs. So were the mounds of which the pyramids in Egypt and the towers of Assyria were the developments. The astrono-

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mical character of the pyramids of Ghizeh, of the Birs Nimroud, and of other ancient edifices, was probably a characteristic only given to tombs and temples at a later time, when the worship of the heavenly bodies had either replaced other forms of nature-worship, or had at any rate taken the chief position in the religion of the nation. We may indeed well believe that during one and the same era tombs and temples might be erected with astronomical significance and interest—some being raised for the special ceremonial belonging to star-worship, while others, being devoted to other forms than the heavenly orbs, had no astronomical characteristics. Thus may we explain, for instance, the obviously astronomical character of the Birs Nimroud, and the absence of any astronomical relations in others of the temple-tombs known as *Zikkaratus*, in Mesopotamia. Among the pyramids in Egypt and Mexico there are doubtless many which were not connected with the worship of sun or moon, the planets or the stars, but belonged to the worship of other powers, as those that were recognised in the wind and the storm, or in the earth beneath, or in the waters under the earth.

It is manifest, however, that during the rule of the dynasty to which the pyramids and tombs of Ghizeh belonged, all such powers of nature were for a time subordinated to the rule of the heavenly bodies. For, among all these structures, from the Great Pyramid down to the smallest of the stone tombs within the Ghizeh cemetery, the orientation is uniformly perfect. It would seem as though the workers in that place of tomb-temples had felt that now at least the true gods had been recognised, and that the full purpose of such structures as they planned would be attained if their work were purified from all reference save to the worship of the heavenly orbs: The sun, the manifest source of light and life; the moon, whose benignant but scarcely less potent influence they recognised, as month after month she came back in full splendour to their skies; the planets, whose devious wanderings they could not understand, but which they therefore felt to be all the apter emblems of mysterious, perhaps even Unknowable power; and the stars, whose unchanging configurations seemed equally apt emblems of eternal steadfastness.

What solemnity of meaning, what evidence of might and governance, must the heavenly bodies have possessed for those Egyptians of old times, that they should have constructed such altar-tombs as the Great Pyramid and its brother the second Pyramid, for the ceremonial observances by which the will of those orbs was to be read and their influence was to be propitiated! So soon as we recognise this meaning in the pyramids, beyond their intended use as tombs, we understand what before had seemed most mysterious in these structures. We can see that it was worth men's while to rear these immense masses of stone for the observation and worship of the gods of that age, even though each served only for that one person who was afterwards to occupy it as a tomb. Apart from that full belief in a future material life, a veritable resurrection of the body, for each tenant of that place of tombs, where the dynasty and their chief servants were buried, we see that, even during the lives of Cheops and Chephren, the fortunes of these kings were of such importance to the nation as to be worth insuring. And they might be insured, men believed, by such careful study of the movements of the heavenly bodies, such duly performed ceremonial observances in regard to them, as might avail, (1) to determine the precise influence exerted by each orb at each moment of either king's life, and (2) to indicate the time when the combined influences of all those heavenly beings were bestowed most favourably for the success of the undertakings, civil or military, of the ruling dynasty.

Here, verily, was the most impressive nature-worship the human race has yet known. The glory of the sun by day, the ever changing lustre of the swift-moving moon by night, the planets with their mysterious movements over the dome of the great sky-temple (adorned by multitudinous stars, which the fancy of men grouped into strange figurings of men and animals)—in all this men recognised the visible symbols of the unseen majesty of their deities. The movements which they traced, and in that sense knew, spoke to them of the unknown—nay, of what they deemed, and what therefore was for them, unknowable. Had they known what we know of the grandeur of the solar system, and of the still vaster glories of the star-strewn spaces around us, they might still have retained their belief that in the heavenly orbs they saw gods and goddesses, and in the interminable depths of star-strewn space the domain of the deities. But the interpretation of the movements of those orbs as Copernicus, Kepler, and Newton interpreted them would have been as fatal to their faith as it has been fatal to the doctrines—once reasonable, but now absurd—of judicial astrology. It was because those movements were seemingly inexplicable that they seemed divine. What was unknown and unknowable for them was what the unknowable ever has been for men—it was their heaven of heavens, the abode of those powers whose combined influence, ever-acting, all-potent, mysterious, represented for them what the idea of Deity represents for us.

Men could advance no farther in nature-worship than this. No race the world has ever known can do more, if it is to worship outward nature instead of nature's inner soul, than to take the heavens for the temple of the godhead, the heavenly bodies for the powers to be worshipped within that all-enclosing temple. Egyptians, Assyrians, Chinese, Persians, Indians, Mexicans—none among the nations rose beyond this. So soon as the thought—regarded as impious at first—entered the hearts of men, that the godhead is beyond even the mightiest, the vastest, and the most impressive of natural forces, the real unknowable took the place of that which had been but the symbol of the unknowable. The "power, not ourselves, making for righteousness" took the place of the natural powers men had heretofore worshipped. Nay, it may be said that the power which men began now to recognise was not only a power outside ourselves, but a power outside all that is, though including all that is—the glories of the heavens, the powers that rule in air and sea, in forest and river, in mountain and in valley, and in the ever-active regions beneath both land and water—the powers also that rule wherever there is life, and whose most marvellous and mysterious manifestations show themselves in the heart of man himself.

THE STORY OF CREATION.

A PLAIN ACCOUNT OF EVOLUTION.

By Edward Clodd.

IX.—EXISTING LIFE-FORMS (*continued*).

B. *Animals.*

THE several types upon which all known animals are constructed are usually classed under the following six primary divisions, called sub-kingdoms:— (See next page.)

Tabular forms are convenient for clear presentment, but their hard-and-fast divisions are apt to be mistaken for real lines of separation, and in the foregoing list this caution is the more needful because the relations of the things set forth

Invertebrata	Protozoa (Gr. *Protos*, first; *zoon*, animal)	Simplest forms	*Ex.* Moneron, amœba, sponge
	Cœlenterata (Gr. *Koilos*, hollow; *enteron*, bowel)	Hollow-bodied	*Ex.* Polyp, anemone, coral-builder
	Echinodermata (Gr. *Echinos*, a hedgehog; *derma*, skin)	Spiny-bodied	*Ex.* Sea-urchin, starfish
	Annulosa (Lat. *Annulus*, a ring)	Joint-bodied	*Ex.* Worm, crab, spider, ant
	Mollusca (Lat. *Mollis*, soft)	Soft-bodied (but usually protected by a shell)	*Ex.* Sea-squirt, oyster, snail, cuttle-fish
	Vertebrata (Lat. *Vertebra*, a joint)	Back-boned	*Ex.* Fish and all other higher life-forms to man

are intimate and indissoluble, the several sub-kingdoms merging one into the other like the colours of the rainbow. Moreover, any consecutive arrangement can only broadly indicate the relative order of the several life-forms, because development has not proceeded in direct line—*e.g.* the ant, which belongs to the Annulosa, is the highest of all invertebrates; but it is not, therefore, most nearly allied to the lowest vertebrate. The connecting link between these two great divisions, as will be shown presently, is found in the double-necked, bottle-shaped sea-squirt, or Ascidian (Gr. *askidion*, a little bottle), which is classed under the Mollusca, and for this reason that sub-kingdom is placed last but one in the ascending scale. If we go back far enough we find the common starting-point of all, whence they travelled for a while along the same road, and then diverged wider and wider apart, until it now seems difficult to believe that the lowest and highest of both plant and animal are one in community of origin.

I. PROTOZOA.—The lowest member of this group—in other words, the lowest known animal, if we except certain parasites, is the *moneron* (Gr. *monos*, single). Like the lowest plants, it lives in water, the element in which life had beginnings. It is an extremely minute, shapeless, colourless, slimy mass, alike all over, and therefore without any organs. When we say that it is alike all over, we mean that our range of vision does not enable us to report otherwise, for doubtless the simplest and smallest living thing is very complex in structure. And we mean, further, that there is no differentiation, as it is called—*i.e.* no formation of specific organs for the performance of specific functions. The functions of living things are threefold—nutrition, reproduction, and relation; in other words, to feed, to multiply, to respond to the outer world, and all these the organless moneron discharges. Every part of it does everything: it takes in food and oxygen anywhere, and digests and breathes all over its body. It literally "gets outside" its food, having the power of throwing out finger-like prolongations, called pseudopods, or false feet, with which it propels itself and spreads over its prey, sucking the soft body even from shelly creatures and casting away the refuse. So far as the function of nutrition, which includes digestion, circulation, and rejection of waste, and the function of reproduction, are concerned, the moneron performs these as completely as the highest animals. For these, with their complex sets of organs—lungs, heart, stomach, &c.—cannot do more than nourish themselves and keep the body in health. And in reproduction, which the moneron effects by dividing itself into two, as do the lowest plants, wherein, as in it, there is neither male nor female, it accomplishes in simple fashion what the higher life-forms can do only in a more complex way. So that the difference—which, however, is in degree and not in kind—between this slime-speck of protoplasm and the higher organisms, all made of like stuff, is in the discharge of the function of relation.

Reference has been made to the response to stimulus from external things manifested by the lowest life-forms although there is no trace of a nervous system in them, and now that we are treating of a living mass that not only feeds and digests and breathes all over, but likewise feels all over, a few remarks upon the origin of nerves may supersede the need for any detailed account of the several nervous systems in the representative animal types.

The function of the nerves is to bring the organism into relation with its surroundings; they are the special media of communication between the body and the external world, and between the brain and every movement of the parts of the body. Starting in the higher animals from the encased brain and ensheathed spinal cord, and diffused in the lower animals in less complex arrangement, they report from without to within. The vibrations of the ethereal medium that affect us as light enter the eye and pass along the optic nerve, which conveys the impulse to the brain, and it is the brain, not the eye, that sees. So with the air-vibrations that travel along the aural nerves; the sensation of sound resides in the brain, not in the ear; so with all the manifold sensations that we feel.

Therefore, wherever there is sensitiveness to impressions, however dim and feeble this may be, there the function of relation is being exercised. This sensitiveness is exhibited by the moneron in its shrinking when touched, and in its grip of food; but the sensitiveness is diffused, and not located in any organs. In members of the same sub-kingdom as it, there are faint traces of approach to nerve-structure, and the development of this is manifest in ascending scale till in the highest life-forms, among certain invertebrates and vertebrates, it reaches subtlest complexity.

Now as every part of a living thing is made up of cells, and the functions govern the form of the cells, the origin of nerves must be due to a modification in cell shape and arrangement, whereby certain tracts or fibres of communication between the body and its surroundings are originated.

But what excited this modification? The all-surrounding medium, without which no life had been, which determined its forms and limits, and touches it at every point with its throbs and vibrations. In the beginnings of a primitive layer or skin exhibited by creatures a stage above the moneron, unlikenesses would arise, and certain parts would by reason of their finer structure be the more readily stimulated by, and the more quickly responsive to, the ceaseless action of the surroundings, the result being that an extra sensitiveness along the lines of least resistance would be set up in those more delicate parts. These, developing, like all things else, by use, would become more and more the selected paths of the impulses, leading, as the molecular waves thrilled them, to structural changes or modification into nerve-cells and nerve-fibres of ever-increasing complexity as we ascend the scale of life. In brief, the stimulated film becomes modified into filaments; and the entire nervous system, with its connexions; brain and all the subtle mechanism with which it controls the body; organs of sense, with their mysterious selective power—the eye to receive light-vibrations, the ear to receive sound-vibrations, the nose to detect the fragrant and the foul; alike had their origin in infolded tracts of the primitive outer skin. The brain arose from such infoldings sinking down beneath the surface, and finally becoming imbedded in other tissues; the eye and the ear, as their parts developed, were joined from within by outgrowths from the brain. Such, in fewest words, is that theory of the origin of nerves which, formulated by Herbert Spencer, has been confirmed by all recent

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biological research. And development by cell-modification applies to the body throughout, to bone, to cartilage, and sinew, as well as to the myriads of nerve-tissues, varying between the fifteen-hundredth and the twelve-thousandth of an inch in breadth, that keep us in touch with the universe. But, easy as it is to dissect and describe the nervous mechanism, the nature of the connexion alike between nervous impulse and consciousness in a man, and between sensation and contractile action in a moneron, remains an insoluble mystery.

What has been said concerning the diffused sensitiveness of the lower animals adds force and suggestiveness to Hæckel's remark, quoted in a former chapter, that the plant sealed its fate, limiting the action of the outer world upon it, when the protoplasm enclosed itself within a wall of cellulose. This isolation, or lessened susceptibility to the vibrations of air and ether, to changes of temperature, and a thousandfold subtle influences, the animal escaped by remaining mobile and setting up no barriers between itself and its environment.

A short step upward from the moneron brings us to the *Amœba* (Gr. *amoibe*, change), so called from its constant change of shape as it protrudes and withdraws the pseudopods. It shows approach towards unlikeness in parts, from the simple to the complex, in the modification of the protoplasm into a membranous skin at the surface, and in a nucleus near the centre, with an expanding and contracting cavity for distributing food and oxygen in the body—a primitive apparatus for digestion and circulation. Therein is the beginning of a division of function, of a distribution of labour, leading to cell-modification into organs. Some of the lowest amœbæ secrete, like the diatoms among plants, solid matter from the sea, building for themselves primitive organs of shelter and defence in the shape of exquisitely-formed chambered shells pierced with holes through which the soft body is connected and the pseudopods pushed for capture of food, which, as throughout the animal kingdom, consists of organised matter. Some form their skeletons of lime, others of flint, evidencing to the possession of a selective power or affinity by even the minutest creatures, and it is these skeletons of ancient foraminiferæ that compose vast beds of organically-derived strata.

Still more marked advance towards unlikeness in parts is shown in the *Infusoria*, so called because readily developed in infusions of exposed vegetable matter, wherein they crowd by myriads in the space of a water-drop. Instead of the pseudopods of the moneron and the amœba, we find vibrating filaments or cilia, by which supplies are swept into the body, which is furnished with an opening or rudimentary mouth and short gullet, through which the food and oxygen pass to the body-cavity. The protozoa which are free to move about can procure their food and oxygen easily, but such as are rooted to one spot have to develop special organs for securing these necessaries of life. These we find provided in the colonies of amœbæ known as *Sponges*, which, however, stand midway between the first and second subkingdoms, since division of labour is further developed in them, and traces of a nervous system are found among certain species. Very lovely are the skeletons which some of them secrete, such as Venus's flower-basket with its graceful fretted spirals; but more familiar to us are the useful fibrous and porous domestic sponges woven of material said to be chemically allied to that spun by silkworms. The amœbæ living on the outside of the sponge can procure food and oxygen easily; not so those living in the inside, and to effect this they have developed cilia, the whiplike action of which drives the water, charged with food and oxygen, through the innumerable canals, whence, having served its purpose, it is driven out, through other canals, carrying the refuse from the amœbæ with it. The whole sponge represents, as has been aptly said, a kind of submarine Venice, "where the people are ranged about the streets and roads in such a manner that each can easily appropriate his food from the water as it passes along."

II. Cœlenterata.—Speaking broadly, all the animals included in the first sub-kingdom are made up of single cells united together, but like one another; now we find the animals made up of many cells more or less modified into tissue, although still of low organisation, one evidence of which is that, like the protozoa, they have no vital parts, and that there is no separate canal for absorbing food and carrying away refuse, the mouth still opening direct into the body-cavity.

The lowest representatives of the "hollow-bodied" are the tiny cup or tube shaped, jellylike, green-hued polyps named *Hydra*, which, with their budlike clusters of young —soon to start in life on their own account—are found clinging, mouth downwards, to weeds and rubbish in fresh water. From the mouth hang a number of tentacles containing cells, in which lie barbed threads coiled up in a poison fluid. When anything touches these tentacles they contract, the cells burst and fling the threads, lassolike, around the prey, poisoning it with the fluid. From some of the marine species which secrete tubes of flint and project themselves therefrom like flowers, so that the sea-depths are covered with their waving, plantlike forms, the buds detach themselves, and become the beautifully tinted *Medusæ* or jelly-fish. These produce eggs which become rooted polyps, so that the offspring never resembles its parents, but always its grandparents. All living matter is largely made up of water, the average proportion ranging from seventy to ninety per cent., but in the jelly-fish it is about 400 to 1. Yet, fragile as is the creature, its structure is complex. Canals traverse the swimming-bell, and carry food and oxygen to every part; rudimentary muscles in the shape of contractile tissues propel the animal along, in rhythmic grace of motion; a nervous system runs round the margin of the bell; there are rudimentary eyes in beadlike pigment-spots, and rudimentary ears in small sacs also along the margin; and the hanging tentacles are charged, as in its fresh-water ally, with deadly fluid.

Lovelier still, and of slightly more complex structure, are the variously coloured *Sea Anemones*, with their petal-like tentacles; while nearly allied to these are the colonies of *Coral-builders*, which, despite the surging wave and drifting current, raise their treelike structures, foundations of solid land on which the bird will build her nest and man set his dwelling.

III. Echinodermata.—This division includes all rayed animals, the skin being hardened by the secretion of jointed or leathery plates, or of spines or hedgehog-like prickles. In some, as the *Starfish*, the rays spring from a common centre; in others, as the *Sea-urchin*, they are coiled to form a globular body; in the *Sea-lilies*, which abounded far back as Silurian times, but which are now rare, they spring, flowerlike, from the end of a fixed stalk; in the sluglike *Sea-cucumbers*, which possess the power dyspeptics may envy of throwing away the inside of the body and growing it anew, the skin is tough, the limy matter being secreted in scattered spicules.

All the echinoderms have the alimentary canal shut off from the body-cavity, involving special provision for nutrition. This is effected by a number of canals which communicate with the outside of the body, and through which the sea-water is driven by cilia, as in the sponges. The water is also pressed from the canals into numerous little suckers, by which the animal crawls along—nature's first

essay in land locomotion. There is a distinct nervous system, the fibres of which in the starfish run along each ray, at the tip of which is an eye, having about two hundred crystal lenses, and a primitive eyelid in the form of a filmy covering.

Thus far an intimate relation may be noted between the life-forms of the invertebrates. The differences between the secretions of limy matter by the amœba and by the sea-urchin, between the contractile action of the moneron in every part and the localisation of nerve-function in the medusa and the starfish, between the vacuole of the amœba and the digestive canal of the sea-cucumber, are differences of degree and not of kind. They are one and all due to cell modification arising out of advance from the like to the unlike, from the simple and general to the complex and special, from the organless to the organised, and any addition to the bare details given above would only bring the more prominently into relief the fact of an indissoluble, underlying unity.

NOTE.—The word "certainly" on which Mr. Dawson animadverts was a slip of the pen omitted in proof, but overlooked in revise. My agreement with Mr. Dawson is shown in the note appended to table in the April number, p. 174, and which has probably escaped his eye; but my regret that the error in the March number was not referred to by me is lessened by the fact that it has called forth Mr. Dawson's interesting paper.

THE WELL OF ENGLISH UNDEFILED.

MR. HARRISON AND MR. FREEMAN.

MR. HARRISON has all the best of the argument with Mr. Freeman about the corruption of good old English into good old Saxon, and other forms of literary affectation. In fact, as to the general position maintained by Mr. Harrison there could be no two opinions among men whose common sense has not been overgrown and choked by pedantry. Not history alone, but literature generally, not even literature alone, but literature, art and science, are exposed to the affectations of those who are not satisfied to understand, but insist that they shall not be understood. Mr. Freeman is a type of a class—men who acquire a very full knowledge about a department of very moderate extent, and imagine themselves thenceforth supreme over that department, not only as dealt with by them but in all its relations with outside matters. Mr. Harrison compares his opponent with a brickmaker who should tumble a lot of bricks on the people's highway, and who, when remonstrated with by some one more careful of the people's rights, should say that the man who thus interfered with him was not a builder, knew nothing about bricks, nay, probably had never been in a brickfield in his life. It is a way all men have who too long and too rigidly confine themselves to one line of research. Mr. Harrison is quite right in insisting that it is wrong. As no private person has a right to hamper the people's highway, so no special student can be allowed to cumber our nation's language, the people's English, with words of his own making. Observe, we say "cumber"; "every builder in the Temple of Research" is free to leave "bricks of his own making" in the highway of the people's language occasionally and in moderation. But among pedants there is very little moderation.

In his reply to Mr. Freeman Mr. Harrison uses, as in his original remarks, the best possible weapon for his purpose—ridicule. Your pedant cannot bear ridicule. He cannot understand it. He has aimed to be Sir Oracle, and when some one sets all the dogs barking at him he is perplexed in the extreme. It is the best proof that there is no better implement for castigating his particular offence than well-directed ridicule. Sidney Smith once used a somewhat unsavoury comparison in regard to the use of ridicule in such cases. We shall not follow him in that, but his opinion was right in itself. There are offences which can only be effectively treated in one particular way, and when under that treatment the offenders squirm, we know that the right method has been employed.

Thus does Mr. Harrison put this point:—

"Mr. Freeman is much scandalised with me for beguiling the tedium of discussion with a jest or two; and he says my style of controversy is not that of 'a serious scholar.' I cannot undertake to be always in full academicals; and I think that, if an argument is sound, it is none the worse for being presented in a pleasant way. A great master told us it was best always to mix the *dulce* with the *utile*. I can remember how poor Robson used to preface his immortal 'Villikins' with the warning: '*This is not a comic song!*' but the warning was always lost on me. Why is it to be assumed that, if we are merry, we cannot be wise? I know that in this age of Teutonic *Gründlichkeit*, unless a man will school himself to be as dull as Professor Gneist, he is supposed not to have an ounce of Research in him. It used not to be so in the glorious eighteenth century. Hume and Gibbon, Diderot and Turgot, did not find learning incompatible with a lively manner or with good English and good French.

"The line which Mr. Freeman adopts is the one with which his readers are quite familiar. He behaves like a tutor correcting a pupil's exercise, and giving him what schoolboys call a 'ballaragging' for false concords and quantities. He cries out, 'Read what I have written in So-and-so! I suppose you think this? and, Why do you not read the other?' Every one knows that to cross Mr. Freeman in one of his linguistic fads is to risk being treated as my little boy was treated in the Zoological Gardens when he offered a bun to the porcupine. But I have had some experience with the *fera naturæ*; and I have been conversant with the English language for a good many years. Of his work as an historian I have spoken with the great respect I unfeignedly feel; but in the matter of the best mode of writing our native tongue I cannot accept the authority of the most serious of scholars. Were I to put on my cap and gown, and had I the Professor before me to examine in the history of law, or of modern philosophy, or of the industrial movement, or the like, I should do my best to give him his '*Testamur*' politely, and I certainly should try not to look as if I were about to give him a caning."

Mr. Harrison very justifiably remarks further on Mr. Freeman's pedagogic style:—

"To employ such a tone to me is surely a little out of place. I have been occupied all my life, just as Mr. Freeman has, in learning, teaching, and studying; and, if my special periods or subjects are not quite the same as his, we are on fair terms in a question of general literature. Moreover, it so happens that, in my professional duty as professor of Constitutional History, these books which he tells me to go and look into are the ordinary text-books of my daily work."

The best of the fun is that after showing thus neatly how Mr. Freeman had forgotten himself, Mr. Harrison shows how, in quite another sense, Mr. Freeman has not remembered himself:—

"I mention a few points whereon he declares me to have blundered: but where the blunders are not mine, but his. Where, he asks, did I get the form *Knud*, for *Cnut*?

'*Knud*,' says Mr. Freeman, is 'quite beyond me.' Well! I got the form *Knud* from Mr. Freeman himself. In his 'Old English History,' edition of 1878, p. 222 (a little book expressly written for children), I read as follows:—'*Cnut* or *Knud* is his real name. He is often called *Canutus* or *Canute*. . . . It is better to call him by his own name.' Again, in the 'Norman Conquest,' vol. i. p. 442 (edition of 1867), I find as follows:—'*Cnut* or *Knud*, in one syllable, is this king's true name.' Having these passages under my eye, I wrote:—'*Cnut* or *Knud* . . . had rather a queer look.' I did not say that Mr. Freeman constantly used *Knud*. He tells children it is better to call the king by his own name, and that *Cnut* or *Knud* is his real name. And now he says *Knud* is quite beyond him; and that it would indeed look odd to talk about *Knud*. So I said."

"Then about Edward the Elder. Mr. Freeman reproves me for saying that Edward called himself *Rex Anglo-Saxonum*; that it ought to be *Rex Angul-Saxonum*. It so happens, that to be quite safe, I had before me, when I was writing this sentence, that admirable little book, 'Old English History,' by E. A. Freeman, p. 139 (edition of 1878), where I read that, 'He [*i.e.* Edward] commonly calls himself *Rex Anglo-Saxonum*' (*sic*). I simply copied out those words, as I was dealing with Mr. Freeman about a popular mode of speech. I was quite aware that the spelling of the Charters is *Rex Angul-Saxonum*, because, in writing, I had under my eye as well Mr. Green's 'Conquest of England,' pp. 192, 193, and Bishop Stubbs's 'History,' vol. i. p. 173, both of which so spell the title. But since the matter in hand was the name *Anglo-Saxon* itself, not the spelling of the name, I was satisfied to follow Mr. Freeman's *Rex Anglo-Saxonum*."

"Then, says Mr. Freeman to me, whence do I get my *Karl*, and where for twenty years past has he himself said anything about *Karl*? I did not assert that Mr. Freeman usually writes of *Charlemagne* as *Karl*. On the contrary, I wrote—'Professor Freeman taught us to speak of *Charles the Great*.' When, later on, I wrote—'we have all learned to speak by the card of *Karl*,' I had in my mind and under my eye a very famous essay, where I read the name *Karl* six times in twenty lines of print, all about the 'Legend of Charlemagne,' and the 'History of Karl.' My edition of this essay bears the date 1872. I cannot undertake to remember all the editions of all Mr. Freeman's books, or when he first dropped *Karl*. But having written that 'Professor Freeman taught us to speak of *Charles the Great*,' I felt amply justified by this essay in adding in a merry vein, 'we have all learned to speak by the card of *Karl*.' Professor Freeman's lessons are not so soon forgotten as he thinks."

This is as amusing as anything we have heard of in this line. But Mr. Harrison can see the serious aspect of the offence he thus ridicules. We commend to the very careful attention of our readers the remarks with which he draws his reply towards its close:—

"Names and words are current coin of the realm, which, for public convenience, have definite values; and to clip and deface them is to debase the linguistic currency. It is the part of a good citizen and a sensible man to carry on his transactions in the current coin, taking them and counting them at their official value. If a man, in order to make his words answer to facts, and not to raise any 'false ideas,' were to cut a five-shilling piece in two, and to offer the bits as two half crowns, the public would call him crazy, and the police would treat him as 'a smasher.' Mr. Freeman is really trying to pass amongst the lieges Saxon *sceats* and *scillings*, as if they were good current coin. The first magistrate before whom he is brought will tell him that *sceats* and *scillings* are not now in circulation, and that private persons have not the right of coining.

"Of course in this matter of spelling there are very real and important points behind. It is a serious evil to unsettle the language. It is unkind to throw fresh stumbling blocks in the way of education. All singularity in forms, without motive or without adequate motive, is a fresh difficulty and a source of offence. If we tried to torture *all* names in history out of their current forms and into their contemporary orthography, if we tried with the modern alphabet to represent the various sounds of a hundred different languages, to spell the same name in a dozen different forms, according to the century of which we are speaking, this would produce a literary chaos. And since there is no adequate reason for specially selecting any one epoch or any one race for this equivocal distinction, it is the part of good sense and good English to be content with the current names long familiar to us in the best literature. These names, no doubt, do differ moderately, and from time to time, as language grows, changes in form are spontaneously adopted. But the claim of any scholar, however eminent, of any knot of scholars, to sweep the board of the familiar names for one particular epoch, and systematically to force on us and on our children another language in names—this is a bad claim, and ought to be resisted."

Extend what is here said chiefly of historical literature to literature generally, including the literature of art and science, and we have the true gospel in regard to the development of language. Technicalities have no more place in literature than medals have in current coinage.

COAL.

By W. MATTIEU WILLIAMS.

THE SOURCES OF TERRESTRIAL CARBON.

THE engraving on p. 271 supplies an interesting illustration of the most characteristic of the coal-measure rocks. It is an engraving on wood, from a photograph of a piece I picked up on the spoil bank of a pit-sinking at Leeswood, in Flintshire. The extreme length of the specimen (measured on the face that is here represented) is $6\frac{1}{4}$ inches, and its thickness not quite $2\frac{1}{2}$ inches. It is the "Linstay" or "Linsey" rock I have already described, and it displays about thirty miniature seams of coal, with interlayers of sandstone. They do not come out so distinctly in the photograph as in the original on account of the shadows due to overhang; the middle dark band is made up of more than a dozen alternations.

This specimen also presents a natural diagram in miniature of what so commonly occurs on a large scale in most coal beds—very vexatiously and frequently so in Flintshire. This is a fault. The working goes on smoothly enough along one of the seams indicated by the dark lines until it reaches the vertical dark line, which is a sort of crack running down through the strata. On crossing this the coal disappears, and the miner has to learn whether the fault is an upthrow or a downthrow, which he does by examination of the strata which is presented to him instead of coal. He knows by the record of strata (always carefully kept) through which he passed in sinking the pit what is above him, and if he comes upon a downthrow he may at once recognise his position, and estimate the measure of downthrow and consequent depth he has to sink in order to reach the coal again.

In the opposite case, when he meets an upthrow—*i.e.* when he has been working in a downthrow—he may or may

not have so definite a guide, according to whether or not other and deeper sinkings than his own have been made in the neighbourhood and the lower measures recorded in detail.

I may here note the origin of the geological technicality "coal measures." To anybody who, like myself, has had to pay the wages of sinkers (*i.e.* the men who sink the shaft), the etymology is very obvious, as the men receive a different rate of pay per yard, according to the character of the material through which they pass, whether "metal" or "rock," and the fortnightly pay is regulated by the character and amount of the *measures* of the work done; thus the strata themselves come to be described as "measures."

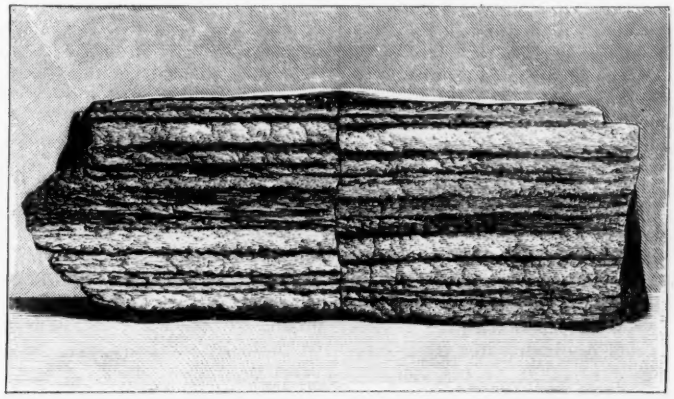
Some geologists have assumed that during the carboniferous period the atmosphere contained a larger proportion of carbonic acid than at present. This speculation is based on the fact that the carbon, which constitutes the bulk of plants, is obtained by them from the carbonic acid of the atmosphere by a process of dissociation in which the leaves or other green parts of the plant employ the solar radiations to separate the carbon from the oxygen with which it is combined in the carbonic acid. This theory is not so well received now as when I attended Professor Jamieson's class in Edinburgh, but the problem which it struggled to solve still remains. It is one of great magnitude, and though commonly evaded, is so fundamental that until it is solved we must confess ourselves profoundly ignorant of the barest rudiments of geological philosophy.

To understand the magnitude of this problem a few figures are necessary. In the first place, the quantity of carbonic acid at present existing in the earth's atmosphere, as determined by the most careful analysis, is between 0·04 and 0·05 per cent. by volume, or $\frac{1}{1333}$ part by weight *over the land*. Over the sea it is much less, the mean of the whole earth falling short of $\frac{1}{2000}$ part by weight. The mean pressure of the whole atmosphere is, in round numbers, 2,000 lbs. per square foot, and thus we arrive at 1 lb. as the total quantity of carbonic acid over every square foot of the earth's surface. 1 lb. of carbonic acid (carbonic dioxide) contains but $\frac{6}{22}$ of carbon, in round numbers 4½ ounces, or the quantity contained in 5½ ounces of ordinary coal. Therefore all the carbonic acid now existing in our atmosphere is only capable of producing a film of coal covering the earth, and weighing 5½ ounces to the square foot. A cubic foot of ordinary coal weighs from 80 to 85 lbs.; therefore the stratum of coal obtainable by using up the whole of the carbonic acid in the earth's atmosphere would be not quite $\frac{1}{240}$ of a foot, or less than $\frac{1}{20}$ of an inch in thickness.

Mr. J. L. Mott, in a communication to the British Association, 1877, concludes, as the result of careful calculations, that the average amount of unoxidised carbon deposit in the crust of the earth amounts to three millions of tons per square mile; this would be represented by four millions of tons of coal, or, in round numbers, 3 cwt. to the square foot. This is 1,000 times more than all the carbonic acid now existing in our atmosphere is capable of producing. If the atmosphere had at any period of the world's history contained $\frac{1}{1000}$ of this amount, animal life, such as indicated by animal fossils, would be certainly impossible. Therefore some great reservoir of carbonic acid is demanded, far exceeding that ever contained in any breathable atmosphere. Besides this, for every 6 lbs. of carbon separated from the carbonic acid 16 lbs. of oxygen must be evolved.

It is customary to pass over this difficulty rather lightly, as Lyell does when he says that "we may imagine time to have multiplied the quantity of carbon given out annually by mineral springs, volcanic craters, and other sources, until the component elements of any given number of coal seams have been evolved from below, without any variation in the meantime in the constitution of the atmosphere."

The contribution of volcanoes to the carbonic acid of the atmosphere is effected chiefly by the decomposition of lime-



stone and magnesian rocks—carbonates of lime and magnesia. Pliny the elder was suffocated by the carbonic acid from Vesuvius. If these are made to give off their carbonic acid by simple heating, as in a limekiln, they practically contribute no carbonic acid, as the alkali left behind is greedy for carbonic acid, and sooner or later finds it in air or water; but when the carbonates are heated sufficiently in contact with silicious rocks, the silicic acid combines with the lime or magnesia, taking the place of the carbonic acid, which is released as gas.

Those who describe this as a sufficient source of supply of carbonic acid usually (or always, so far as I can learn) take no account of, and apparently do not understand, another action which is exactly the opposite, an action in which the carbonic acid of the air is absorbed and releases silicic acid. This is more potent than the volcanic opposite, though less striking, as it goes on steadily and continuously —has been going on from the earliest geological periods. It is called *kaolinisation*, or the conversion of the silicates of potash and soda contained in the primary crystalline rocks into kaolin, *i.e.* the clays that have been formed from their disintegrated and decomposed materials.

Dr. Sterry Hunt has carefully calculated the amount of carbonic acid required for the production of a stratum of 500 mètres (1,640 feet) of kaolin or clay, or clay-rock, over

the whole surface of the globe, and finds that, if produced by the kaolinisation of orthoclase, it must have used up a quantity of carbonic acid equal to twenty-one times the entire weight of our atmosphere, *i.e.* $2000 \times 21 = 42000$ times as much carbonic acid as the air now contains. The demand for this gas in the decay of such silicates as hornblende, pyroxene, and olivine is five times as great; therefore such a stratum produced from these would have used up 210,000 times as much carbonic acid as our atmosphere now contains.

But this is not all, nor nearly all. If the earth were ever in the heated condition usually supposed, no such carbonates as our magnesian and limestone rocks, nor other earthy carbonates from which they might be formed, could have existed; the lime, the magnesia, &c., must either have been in the caustic condition or combined with silica, most probably the latter.

The demonstrable chemical conditions necessary for the existence of such carbonates force upon us one of two alternatives. We must either abandon altogether the theory of a highly heated globe that has cooled down, or regard all the carbonic acid existing in our limestones, &c., as of atmospheric origin—as a constituent which they have obtained from the atmosphere subsequent to their cooling down.

The carbonates in the earth's crust have been estimated as equivalent "to a continuous layer of limestone 869 mètres (2,851 feet) thick, and probably to more than double this amount." (Sterry Hunt.) According to this the earth contains in this form an amount of carbonic acid equal in weight to 100, if not to 200 atmospheres like the present, or 200,000 to 400,000 times the amount of carbonic acid now existing in the atmosphere.

Adding all these quantities together, we reach an amount of carbonic acid of atmospheric origin which utterly confounds all the prevailing notions concerning the past history of our globe in its relations to its atmosphere. Dr. Thomas Sterry Hunt, who is a philosophical chemist and geologist, one who is not satisfied with merely repeating the lessons he has learned at college and adding to them the mechanical results of laboratory and field work, has treated this subject with his customary vigour and originality in a paper communicated to the *American Journal of Science*, vol. xix., May 1880, on "The Chemical and Geological Relations of the Atmosphere;" also in another paper in the same journal, vol. xxiii., February 1882, on "Celestial Chemistry from the time of Newton;" and in the preface to his volume of "Chemical and Geological Essays," published by the Naturalist's Agency of Salem. I strongly recommend the study of these papers to all who are interested in this subject. A summary of them will be found in the abstract of a memoir presented by their author to the British Association at Dublin, 1878, which is printed in their "Proceedings," and also in *Nature* for August 29, 1878.

The solution which he offers is the following, quoted from p. 356 of the *American Journal of Science*, May 1880:—"The problem still before us is, then, to find the source of the vast amount of carbonic dioxide continuously supplied to the atmosphere throughout the geologic ages, and as continuously removed therefrom, and fixed in the form of carbonaceous matters and limestones. We have shown reasons for rejecting the theory which would derive the supply either from the earth's interior or from its own primal atmosphere, and must therefore look for it to an extra-terrestrial source. The new hypothesis, which we here advance, starts with the assumption that our atmosphere is not primarily terrestrial but cosmical, and that the air, together with the water surrounding our earth (whether in a liquid or a vaporous state), belongs to a continuous elastic medium, which, extending through the interstellar spaces, is condensed around attracting bodies in amounts proportional to their mass and temperature. This universal atmosphere (if the expression may be permitted) would then exist in its most attenuated form in the regions farthest distant from these centres of attraction; while any change in the gaseous envelope of any globe, whether by the absorption or condensation, or by the disengagement of any gas or vapour would, by the laws of diffusion and static equilibrium, be felt everywhere throughout the universe."

Those who have read my essay on "The Fuel of the Sun" (January 1870) know that I arrived by a different path to the same conclusion as Dr. Hunt concerning the universal diffusion of atmospheric matter. I regard such diffusion into all space which is receiving radiant heat as a necessary and demonstrable operation of the firmly established laws of gaseous diffusion.

The revelations of the spectroscope suggest a further development of this hypothesis. The characteristic feature of the spectrum of comets is the pair of bright lines a little way beyond H in the ultra-violet region, which correspond to those obtained artificially from hydrocarbons, such as olefiant gas, &c. Similar lines have been observed in the trail of meteors that have penetrated our atmosphere. The researches of Schiaparelli and others have shown an intimate connection between these meteors and comets.

In the *Gentleman's Magazine* of August 1881 I ventured to put these facts together, and to suggest that "comets and fiery meteors, instead of being the weapons of divine vengeance, wielded for the destruction of the world, have been beneficent contributors of the chief material of its animal and vegetable life"—my supposition being that there is diffused through the usually assumed vacuity of space (or at least in that portion through which our solar system travels) considerable quantities of matter having the nature of volatile hydrocarbons, such as paraffin, naphthalin, benzole, &c.—most probably paraffin—which exist, according to temperature, either as solid, liquid, or gas; and which, striking our atmosphere in the form of solid particles, are heated and burnt by the collision, thereby producing both water and carbonic acid, which would thus be gradually and perpetually introduced.

At the Southampton meeting of the British Association (1882) Captain Abney read a paper, in which he stated that he had found benzine and ethyl "indicated in the spectrum at sea level, and found their absorption lines with undiminished intensity at 8,500 feet. Thus, without doubt, hydrocarbons must exist between our atmosphere and the sun, and it may be in space." (*Nature*, October 12, 1882, p. 586.)

GALILEO, DARWIN, AND THE POPE

By RICHARD A. PROCTOR.

BETWEEN Mr. Mivart, a Catholic believer in the evolution of man from lower forms of animal life, and the Rev. J. Murphy, Catholic theologian, a controversy has arisen which well deserves to be noted, because it serves to indicate the precise attitude of the Catholic Church towards the doctrine of evolution and science generally.

On the one hand, Mr. Mivart has maintained that he, as a Catholic, is free to teach that man, so far as his body is concerned, has been developed from lower types of life. On the other, Mr. Murphy asserts, as do most Catholic theologians, that this doctrine is heretical, and cannot be maintained by any loyal Catholic. Mr. Mivart retorts that the

teaching of the Catholic Church on such matters is not authoritative, and cites the case of Galileo to show that when the Pope has dealt with scientific matters he has not been infallible, wherefore "men of science should in no wise allow their efforts after truth to be checked by ecclesiastical declarations." To which Mr. Murphy makes rejoinder that the case of Galileo is quite unlike the case of Darwin, and, moreover, that the Pope never did pronounce on Galileo's teachings after the manner which is essential for all decisions to which the Catholic Church attributes infallibility.

Now, it may perhaps be asked by a large proportion of my readers what possible interest this particular controversy can have for those who neither hold Mr. Mivart's somewhat artificial theory nor take any interest in questions of Catholic theology. In reality, however, a much wider question is seen to be at issue, so soon as the nature of the doctrine of Papal infallibility is understood. So few non-Catholics know what this doctrine is, and so many Catholics misunderstand it (Mr. Mivart manifestly does) that a few remarks on this point (where Mr. Murphy has all the best of the argument) may be necessary.

I premise that, though I am neither a theologian nor a Catholic, I have given more attention to this special matter than most non-theological persons. Nay, many who are by way of being theologians have not had the opportunities I have had, and have availed myself of in large degree, for learning how the matter really stands. I most carefully studied this particular question as dealt with by that pillar of orthodoxy, that champion of convocation, the late Dr. Jelf, Principal of King's College, London, and so far to his satisfaction, at least, that he sent for me to receive his special congratulations on my treatment of the matter. It was almost the last of all the subjects I studied when preparing to join the ministry of the Established Church. It was a subject which I specially studied and ("which is else") *weighed*, during more than eight years, as taught by Catholic theologians. And finally, the associated minor subject, the special doctrine which Mr. Mivart is able to hold while still remaining in the bosom of the Catholic Church, chances to be one which has been again and again described to me by Catholic theologians as unquestionably heretical, and not to be held by any loyal Catholic, their remarks being very specially and personally pertinent. I doubt if any man living, not excepting Mr. Mivart himself, has had so much occasion to consider this special point as I have. This will be understood when I note that there was a time in my life when Mr. Mivart and I stood side by side, he as a student and teacher of biology, I as a student and teacher of astronomy, each, however, with this matter of the evolution of man as a factor in determining his course. He went one way, or rather continued on his course unchanged; I went another. His controversy with Mr. Murphy shows me that had he had the same theological training I had had as to the general principles of Catholic orthodoxy, he could hardly have continued on his course—to one side or to the other he *must* have diverged; to follow the middle course would have seemed to him, as it did to me, no less impossible than—

> —to o'er walk a current* roaring loud,
> On the unstable footing of a spear.

Mr. Murphy is assuredly right in his interpretation of Papal infallibility—in fact there can be, or at least ought to be, no possible mistake on this point. In my opinion, and, so far as I can judge, in the opinion of nearly all Catholic priests, Mr. Murphy is also right in asserting that Mr. Mivart's doctrine of the evolution of man is emphatically heretical.

Papal infallibility, which many fondly imagine to be the weak point of Catholicity, is, rightly understood, its strongest support. The Catholic Church may for ages have been unwilling to emphasize this doctrine by a decree of council; and in this she may have been wise in her generation; for, however strong the doctrine may be in regard to Catholicity, it is unquestionably a weakness in regard to Christianity. It needs no defence against Protestantism, but it needs to be very shrewdly defended against freedom of research if the defence is to be maintained at all.

The doctrine as commonly misunderstood, is, of course, preposterous on the face of it. But the common mistakes about the doctrine are themselves preposterous. One hears an ignorant but most zealous Protestant talk such nonsense as this: How *can* the Pope be infallible when such and such a Pope was notoriously unwise, and such another a man of evil life? It would be just as reasonable to say, How can we believe David to have been inspired when we find that he behaved not only villainously but most foolishly in regard to Uriah the Hittite and his wife? Not quite so absurd, though quite as incorrect, is the idea that Papal infallibility is disproved by the decision (supposing for the moment it received Papal sanction) against Galileo; it is fairly matched by the mistake of supposing that a reasonable doctrine as to Bible inspiration would be shaken by the mistake of Matthew in asserting that all the kingdoms of the earth could be seen from some exceeding high mountain.

The fact really is that the doctrine of Papal infallibility as it is really taught by the Catholic Church is almost a corollary on the doctrine of Bible inspiration. According to the latter doctrine, in its only reasonable form, men like Moses, David, Solomon, Ezra, Isaiah, and the like, in no sense to be regarded as perfect either in wisdom or in conduct, were inspired as respects certain matters which they addressed to men in regard to religion. The former doctrine, in the only form ever adopted by the Catholic Church, asserts that Popes, though in no sense to be regarded as perfect either in wisdom or in conduct, have always been and always will be so far guided or restrained (as the case may be) that *if*, or *when*, they address the whole Church *ex cathedrâ* on matters relating to morals or doctrine their teaching will be true. In conduct a Pope may be imperfect or even wicked; in regard to science, art, or literature he may be ignorant or unwise; in theological matters, even dealt with as by a priest or doctor of the Church, a Pope may make serious mistakes; *but* no Pope, let his personal qualities be what they may (let him even be overbearing as Moses, as unscrupulous as David, as selfish as Solomon, as ignorant as Matthew, or as contentious as Paul), will ever address to the whole Church *ex cathedrâ* false teaching as to morals or as to doctrine. Those who have swallowed so large a camel as the belief that Moses could teach nought unjust, David nothing evil, Solomon nothing loose, Matthew nothing unsound, and Paul nothing false in reasoning, need hardly scoff at those who decline to strain out so small a gnat as the doctrine that a Pope will be prevented from doing, what indeed a Pope would scarcely have a chance of doing—addressing questionable teaching, *ex cathedrâ*, to the whole Church about matters which Catholic theologians have long since settled in nearly every detail.

Be this as it may, the Catholic doctrine on the subject is perfectly definite; and it is absolutely certain that the decision in regard to Galileo's teaching, shown now to have been unsound, does not in the slightest degree affect the doctrine of the infallibility either of the Pope or of the Church.

* The printers are earnestly requested *not* to insert a comma after "current," as in most editions of Shakespeare, since Shakespeare assuredly did not mean that the o'er-walker was loudly roaring, but the current.

XUM

The subject-matter belonged neither to morals nor to faith; the decision was neither *ex cathedrâ* nor addressed to the whole Church; in not one single point does the case illustrate the doctrine of Papal infallibility as defined by the Vatican Council, which pronounced that—

> The Roman Pontiff, when he speaks *ex cathedrâ*, that is, when in the discharge of his office as pastor and teacher of all Christians, he, in virtue of his supreme apostolic authority, defines a doctrine of faith or morals to be held by the universal Church, is, by the Divine assistance promised to him in the blessed Peter, endowed with that infallibility wherewith our Divine Redeemer willed that His Church should be endowed in defining doctrines of faith or morals.

Every Catholic, then, is free to believe that the earth goes round the sun. Nor is there anything in the doctrine of astronomical evolution which need trouble the Catholic, however fatal every such doctrine may be for the believer in an unreasonable doctrine of verbal inspiration. The Catholic may hold what the Protestant cannot loyally believe, that when the writer of the first books of the Old Testament, whoever he may have been, dealt with the sun, the moon, and the stars, there was no absolute necessity, since he was not writing about matters concerning morals or faith, that he should be saved from error.

But, as Mr. Murphy correctly points out, Mr. Mivart is quite mistaken in supposing that the real heterodoxy of a Darwin can be shielded by any evidence as to Church mistakes about the supposed heterodoxy of a Galileo. The Copernican theory manifestly has no connection with the fall and redemption of man; the Darwinian theory as manifestly has a very direct bearing on that special business of the Church. It needs no conclave of cardinals, no utterance of the Pope, *ex cathedrâ* or otherwise, to show that the doctrine of the descent of man from lower animal types, and the necessarily associated doctrine of the origin of evil, are irreconcilable with the teaching of the Catholic Church in regard to the fall of man from a state of original rectitude. Such an attempt as Mr. Mivart's to dissociate the origin of man's spiritual nature from the development of his corporeal nature is manifestly mere playing with the question. An individual person, here or there, may be able honestly (let us hope) to say, "I believe my body came from ancestors of anthropoidal apelike nature, but my moral nature descends from something originally breathed into an ancestral pair anthropoidally apelike in nature." Church creeds, however, are not for individual persons of exceptionally ingenious turns of mind, but for the masses. Assuredly the Catholic Church is not likely to adopt Mr. Mivart's ingenious but very artificial theory. Nor does she even now hesitate to say, whenever the question is directly put to her, that the doctrine is clearly and manifestly heretical.

I view the matter, let me remark in conclusion, from an entirely independent standpoint. I stand neither beside Mr. Mivart nor Mr. Murphy. But from where I am I can see that, while Mr. Murphy stands on perfectly firm and level ground—I say nothing as to its elevation—Mr. Mivart stands, if he stands at all, in a most insecure position. The bough to which he clings, the vain hope that, because the decision of certain Catholic disciplinarians in regard to Galileo proved erroneous, it may still be found possible to reconcile loyalty to the Catholic Church with belief in the theory of biological evolution, or that a fanciful distinction between his views and Darwin's will save him from condemnation, is rotten to the core. In one way or the other he *must* move: he may climb to securer heights, or he may wait till the frail bough breaks and he falls; but stay where he does he cannot, unless, closing his eyes, he sinks his feet very deeply in the morass which he has mistaken for stable ground. Resting *there*, however, will be no salvation.

INDIAN MYTHS.

By "STELLA OCCIDENS."

> Behold it!
> See the sacred Star of Evening,
> You shall hear a tale of wonder,
> Hear the story of Osseo,
> Son of the Evening Star, Osseo!
>
> LONGFELLOW.

TO the imaginative mind of the Indian the starry heavens were suggestive of many quaint and beautiful myths. As he saw the stars, night after night, and wondered at their brilliancy, he wove a halo of romance and superstition around them. Here were supposed to dwell beautiful spirits, or the souls of departed warriors and heroes; and intimately connected with these spirits were the fairies and pigmies, supposed to inhabit the earth. Thus we find that the belief in fairies, gnomes, pigmies, elves, and giants, exists in the folk-lore of the Indian, resembling that of the European nations. Leland * tells us in his tales of magic that "to every Algonquin a rotten log by the road, covered with moss, suggests the wild legend of the log-demon. The Indian corn and sweet-flag in the swamp are the descendants of beautiful spirits, who still live in them. Meeko, the squirrel, has the power of becoming a giant monster; flowers, beasts, trees, have all loved, and talked, and sung, and can even now do so, should the magician only come to break the spell."

An Algonquin myth is related concerning Osseo, son of the Evening Star, which is full of poetical feeling. An Indian hunter who lived in the north had ten beautiful daughters. All were married but Oweenee, the youngest and fairest. She scornfully rejected all her suitors, but at last accepted Osseo:—

> Old Osseo, poor and ugly,
> Broken with age and weak with coughing,
> Always coughing like a squirrel.
> Ah, but beautiful within him
> Was the spirit of Osseo,
> From the Evening Star descended,
> Star of Evening, Star of Women,
> Star of tenderness and passion!

Oweenee's sisters sneered at her choice, but she did not notice them. One evening they were all invited to a feast in honour of the Evening Star, and as they walked along together in the twilight they laughed at Osseo. He would look up at the stars and mutter to himself; and one of the sisters hoped he would stumble and break his neck, so that Oweenee might then have a handsome husband. Osseo was looking at the Evening Star, and addressing his father who dwelt there. As he approached a large wooden log, he suddenly stopped, and uttering a peculiar yell he dashed in at one end and came out of the other—a beautiful youth. He ran on nimbly and joined the rest, but looking for Oweenee he saw in her place an old, wrinkled woman, bent double with age and leaning on a cane. All the sisters laughed at Oweenee, but Osseo was kind and gentle to her. He walked beside her with slower steps, called her Nenemoosha, which means sweetheart, and soothed her with loving words till they reached his father's lodge.

During the feast all were happy but Osseo, who was sad and refused to eat. He would look at Oweenee and then at the Evening Star, which glimmered faintly in the sky. Presently he heard a voice, which sounded like strains of distant music to the rest. It told him to eat, as the food was enchanted and would make him a spirit. All his bowls

* "Algonquin Legends," p. 339.

and kettles should be turned to wampum and silver, and the women should be changed to birds, "and glisten with the beauty of the starlight." "Come, my son," it said, "and dwell no longer on earth. Look steadfastly at my beams; my power is now great. Doubt not, delay not. It is the voice of the spirit of the stars that calls you away to happiness and celestial rest."

Soon the lodge began to shake and tremble, and in a moment it was rising in the air. Before the sisters had time to escape the lodge was above the tops of the highest trees. The bowls and kettles became scarlet shells, the poles of the lodge were now glittering silver wires, and the bark covering them was changed to the gorgeous wings of insects. The sisters were all changed into birds of various plumage, but Oweenee, who still remained old and ugly. Osseo uttered a peculiar yell, and Oweenee became young and beautiful again. When the party reached the Evening Star Osseo's father bade Osseo hang up the cage at the door. He told Osseo that he had shown pity to him on account of his wife's sisters, who had ridiculed him whilst under the power of the wicked spirit. "That evil spirit is Wabeno, the magician, and he dwells in that little star that twinkles yonder. Beware of him, lest his beams fall on you."

Osseo dwelt for many years in peace and quiet with his father, and Oweenee bore him a son, who was as beautiful as his mother and courageous as his father. As the boy grew older the father made him little bows and arrows. Opening the silver cage, he let loose the uncles and aunts for his little son to shoot at. One day the boy shot a bird with his fatal arrow, and, behold! a beautiful maiden stood before him with the arrow in her breast. As the blood fell on the planet the charm was broken: Osseo's son, all the birds, Osseo, and Oweenee felt themselves descending, till they rested on an island in the Big-Sea-Water.

The birds became mortals again, but were transformed into fairies.*

They remained as little people,
Like the pigmies, the Puk-Wudjies,
And on pleasant nights of summer,
When the Evening Star was shining,
Hand-in-hand they danced together
On the island's craggy headlands,
On the sand beach, low and level.
Still their glittering lodge is seen there
On the tranquil summer evenings,
And upon the shore the fisher
Sometimes hears their happy voices,
Sees them dancing in the starlight.†

Now we must hear the story of one of these Puk-Wudjies, or vanishing little men, in connexion with the Morning Star. The Odjibwas have a myth concerning the time when "all the inhabitants of the earth had died excepting two helpless children, a baby boy and girl. The girl developed rapidly, but the boy remained a dwarf, and his sister called him He-of-the-Little-Shell. She made little bows and arrows for him, and in time he became a great hunter. One day he came to a small lake, and saw a man on the ice killing beavers. He-of-the-Little-Shell slipped out of his hiding-place, and wielding his magic shell, cut off the tail of one of the beavers. The man was surprised, on reaching home, to find the tail of one of his beavers gone, and the same occurrence happening every day, he became suspicious. One day he went earlier than usual, and returned home before He-of-the-Little-Shell reached the lake. The latter followed the stranger to his lodge, and let the man, who was no less than Manabozho, see him.

* Schoolcraft, "Hiawatha Legends," p. 71.
† Longfellow, "Hiawatha."

"Who are you, little man?" said Manabozho. "I have a mind to kill you."

"If you were to try to kill me, you could not do it," said the little man.

When he went home he told his sister they must part, as Manabozho would try to destroy them. He asked his sister where she would like to go.

"I would like to go to the place of the breaking of daylight. I have always loved the East. After I get there, my brother, whenever you see the clouds in that direction of various colours you may think that your sister is painting her face."

"And I," said he, "shall live on the mountains and rocks. And I shall ever be called Puk-Wudj-Ininee, or the wild man of the mountains."

He then told his sister that he must go in search of some Manitoes, and after many adventures he returned to her.

"My sister, there is a Manito at each of the four corners of the earth," * he said. "There is also one in the sky, and a wicked one deep down in the earth. We must now separate. When the winds blow from the four corners of the earth you must then go. They will carry you to the place you wish. I go to the rocks and mountains, where my kindred will ever delight to dwell."

Taking his ball-stick he ran up a high mountain, whooping as he went. The winds blew, and his sister was borne to the eastern sky, where she has been ever since, and her name is Morning Star.†

Blow, winds, blow! my sister lingers
For her dwelling in the sky,
Where the morn, with rosy fingers,
Shall her cheeks with vermeil dye.

There my earliest views directed
Shall from her their colour take,
And her smiles, through clouds reflected,
Guide me on, by wood or lake.

While I range the highest mountains,
Sport in valleys green and low,
Or beside our Indian fountains
Raise my tiny hip hollo.‡

* The Indians believe that the earth is a square and level plain, and that the winds blow from the four corners.
† Schoolcraft, "Hiawatha Legends," p. 90.
‡ Ibid. p. 94. These lines are supposed to be addressed to the winds by Wa-Dais-Ais-Imid, or He-of-the-Little-Shell, on transferring his sister to a position as one of the planets in the morning sky.

AMERICANISMS.

(*Alphabetically arranged.*)

BY RICHARD A. PROCTOR.

Do Tell! One of the oddest of the regular Down-East sayings. It does not in the slightest degree signify what it says. In fact it means more nearly "don't tell" than "do tell," being used precisely as country folk in England say, "You don't tell me so!" "You don't say!" and so forth. An equivalent Yankeeism for "Do tell!" or "Dew tell!" is "I *want* to know."

Dough-face. A nickname applied by Northern abolitionists to Northern favourers of slavery.

Dough-nut. A small round cake, made of flour, eggs, and sugar, moistened with milk and fried (Bartlett says "boiled," which seems absurd) in lard.

Dove. In many parts of America "dove" is used as the past of "dive."

Down Easter. Used throughout the States generally for

Yankee or New Englander. But as we approach the Down-East region, the Down Easter retreats, until we find his true place to be in Maine. Possibly in Maine he is pushed farther east still.

[*Drat it.* Bartlett treats this expression as an Americanism. While fully admitting that many expressions, often used in England, are properly classed as Americanisms, if much oftener heard on the other side of the Atlantic, I must draw the line at "Drat it," for there is no part of England, scarcely a house in England, where this singularly elegant expression of feminine wrath is not occasionally heard.]

Draw a Bead, To. To take aim. Probably old English also.

Dreadful. Used for "very," is probably more common in America than in England. "A *dreadful*, or *dreffle* nice gall," is a very nice girl. A dreadful odd way of speaking this.

Drummer. A commercial traveller. Probably derived from the good old times in England, when cheap-jacks and mountebanks announced their entrance into a town with sound of drum.

Dubersome. Doubtful. Bartlett says *duberous* is often used in England. I should imagine it was much oftener used in America. I have never heard of any part of England where "duberous" is used; and I have heard it pretty often in America.

Dug-out. A boat or canoe, dug out of a large log.

Dump. To unload from a cart by tilting is surely as much English as it is American; and *Dumpy*, for sad, is about as old English as well can be. It must have been in use long before the ballad of Chevy Chase, where the gallant Witherington, in most doleful dumps, when both his legs were cut away, did fight upon his stumps.

Dunno'z I know. Lowell gives this as the nearest approach a Yankee ever makes to saying, "I don't know."

Dust. To get out, clear, may be an Americanism; but imagine finding.

[*Duster*, a light garment, used for protection against dust, so classified! We wonder how many Derby days ago the "duster" first made its appearance on Epsom Downs.]

[*Dutch.* "That beats the Dutch," again is given by Bartlett as an Americanism, first used during the siege of Boston in 1775. It belongs in reality to Old England, time of Charles II.]

Dutch, for German, is, however, essentially American.

Eagle. A gold coin, worth ten dollars. *Double eagle*, *half eagle*, and *quarter eagle* need no explanation.

East. "About east" is used in New England for "about right," or what 'Arry in England would call *terrights*.

Eat. To supply with food. "To *eat* guests" means to board them, just as in England people say to "bed," meaning to find a bed for a guest. Sometimes a host may eat his guests in another sense. At a hotel where I once stayed, I found a finely-coloured motto rather unfortunately spelt: it ran "Watch and prey." Its owner carried out the idea.

E'en a' most, an abridgment of "Even almost" is called by Bartlett a vulgarism. It would be well if there were no worse vulgarisms in America or England than this.

"*Eend.*" Yankee for "end." "Who'd expect to see a tatur all on eend at being biled?"—*Lowell.*

[*Egg on, To.* Corruption of "to urge on." See *Drat it.*]

Egypt. Southern Illinois. Bartlett "wants to know" whether this is on account of its fertility or the mental darkness of its inhabitants. I should imagine that any one who had seen the region around Cairo in the good old times (remember that Cairo was the Eden of "Martin Chuzzlewit") would need no explanation. Probably Cairo was so called because the region around Cairo in Egypt after an inundation of the Nile looked about as forbidding as the region around Cairo in Illinois looked all the time.

Elect, To. To choose to do something or other. The American "elects" a president or member of Congress just as the Englishman "elects" a member of Parliament or a churchwarden; but, unlike the Englishman, the American "elects" to do as he pleases about voting.

Elephant. To "see the elephant" is to travel about and see the world.

Elevator. What we call in England a hoist, or an 'oist, according to our aspirations. Americans are not very fond of using their legs, so that elevators there have attained a much greater development than hoists with us. In some American buildings, however, they are a real necessity, as in the *Tribune* buildings at New York. I have had to call on the editor of the *Tribune* after the elevator had ceased to run (midnight), and fond as I am of stair-climbing, which is as good exercise for the legs as rowing for the arms, I should have preferred being lifted part of the way.

Empire State, The. New York State.

Engineer, used substantively for an engine-driver. As a verb, to engineer a road is to plan and work out the plans for it.

Enthuse, To. To grow enthusiastic, or to make others become enthusiastic.

Essence-pedlar. This euphonious name is applied to the skunk, for obvious reasons.

Euchre. A good card game, livelier and less difficult than whist, yet involving a good deal of science.

Euchred. As a card term, means to fail to make three points at euchre, after making or ordering up a suit. Merely to fail to make three means only the loss of a point, but to be euchred means to lose two points. Hence the expression is used for being foiled.

PHOTOGRAPHY AND THE PRINTING-PRESS.

THERE are many persons who regard the art of photography only as a ready means of obtaining the portrait of some relative or friend, or the image of some house or landscape round about which some pleasing memories and associations cling, and of which, therefore, it is desirable to have a reminder in the shape of an accurate picture. Or, perhaps, now that the photographic amateur is becoming such a very familiar, if not to say obtrusive, person, the art of sun-painting may, by the people adverted to, be regarded as a fashion or fad, which, like croquet, lawn-tennis, rinking, and many other amusements, will have its day and its earnest votaries, to be presently forgotten as some newer thing turns up for the attraction of the young and giddy.

But those of a more mature habit of thought, and who are therefore better able to gauge the signs of the times—those particularly who care to look over the columns of the technical journals, even though they may not find there any matter to arouse great interest—cannot but be aware that photography has of late years made rapid strides, not only as a faithful reproducer of the beauties of nature, but as an aid to nearly every branch of the arts and sciences. A brief review of one of the modern applications of photography will, we feel certain, interest a great number of our readers.

In one art at least the photographic plate is gradually working, if it has not already caused, a revolution. We allude to the art of wood engraving. Only a very few years back the process of producing a picture suitable for the

printing-press was briefly as follows. The artist drew his design on the boxwood block—the engraver cut that design—and the block afforded a certain limited amount of impressions before it was worn out and useless. Then the electrotype process came in. The soft block was no longer used in the press, but an impression in wax was taken of its engraved surface, and this waxen mould was subsequently used in the electric bath to furnish a shell of copper, or electrotype, which, when afterwards strengthened and mounted, would furnish a large number of impressions. The wood block itself was put away as an original from which other wax impressions and electrotypes could be taken without limit. But let it be borne in mind that, with the cutting of the block, the work of the artist—regarded as a drawing which would otherwise be valuable—was altogether destroyed.

Improvements in photography changed all this. The artist now executes his work on fine cardboard, with pencil and brush. The picture is in black and white, but not necessarily in lines, as in the old days of drawing on wood blocks. It is drawn in tints—that is to say, the various lights and shades are expressed by washes of colour made up with Indian ink and Chinese white—many of these compositions having a great likeness to the old-fashioned sepia drawings, but possessing a colder colour. The next stage in the process is to copy the drawing on to a wood block. It is here that the camera comes upon the scene, with an advantage not possessed by any other form of copying. The original can be reduced or enlarged to any size required. In practice, enlarging is never, or seldom, asked for; but the reduction of a large drawing to a small block is a frequent operation. This having been done, the block, bearing a most faithful representation of the original, is handed to the engraver, who rapidly translates its varying shades into sharply-cut lines, which accurately convey to the eye, by their varying proximity to one another, the force and meaning of the original work. And here we come to one of the most important features of the operation. The original remains intact and unaltered in every way, and has a market value depending upon the status of the artist who drew it. We recently saw a large collection of these black-and-white pictures, as they are commonly called. They had all been used for reproduction, and had done duty in various publications. They were now for sale, and the prices realised varied from twenty pounds down to as many shillings.

But this is not the only change that photography has brought to the engraver's art. In great measure it has superseded that art. So much so, indeed, has this result been brought about that many engravers who formerly had no difficulty in finding constant work have now so little to do that they have seriously to think of beginning the world afresh. This is the sad side of every improvement which increased knowledge renders possible. The individual suffers for the general good. A large proportion of the pictures which appear in our periodicals—including those of the highest class—have been drawn, photographed, and made ready for the printing-press without any aid whatever from the hand of the engraver. It seems at first sight little short of marvellous that the delicate and fragile image formed by the sun on a glass plate—an image so fragile that it is often torn by the accidental touch of the finger-nail—can by mere mechanical means be changed into a metal plate so rigid and strong that copies by tens of thousands can be obtained from it in the printing-press. That this is strictly within the truth our readers have lately had evidence in those star photographs which have recently appeared in these pages, and which were produced, as has been already stated, quite independently of the engraver's art. The daily newspapers occasionally reproduce pictures of a rough kind, which are also traceable to automatic processes; and here we have indications that the issue of a daily illustrated journal may become probable—it is certainly possible—in the near future.

The process by which a mere line picture (we mean one in which absolute black and absolute white are the only effects involved—a picture, that is to say, without greys or half-tones) can be reproduced is astonishingly simple. The operations depend upon the curious property possessed by a certain class of chemical salts—the dichromates of the alkalies—in rendering gelatine or any colloid substance insoluble after insolation, or exposure to light. Taking the common red salt, potassic dichromate, as a type of those mentioned, let us see how it enables the operator to change a line drawing into a block ready for the printing-press.

First of all, a warm solution of gelatine and water is charged with a certain quantity of the dichromate, or bichromate of potash as it is familiarly called. This mixture is brushed over a sheet of paper, which paper is then hung up in a dark room to dry. In the meantime a negative image on glass has been taken of the line drawing by means of the camera—an image in which the lights and shades are all reversed, and in which, therefore, the original black lines of the drawing are represented by lines of clear glass on a black ground. The negative is placed in a printing-frame, and is backed up with the prepared paper. It is now exposed to light for some minutes, during which time only those portions of the paper can be affected by such exposure as are comprised in the lines of the drawing—for those portions only of the glass negative will permit the light to go through it. When the right amount of exposure has been given, the negative and the paper are again taken into darkness, or darkness only relieved by red illumination, which has no effect on the sensitive chemical employed. The paper, even by this dim light, is seen to have a faint image upon it, but this is for the moment disregarded. It now receives a uniform coating of greasy ink, until every trace of its former appearance is obliterated. The paper is next transferred to a bath of hot water; and now a very curious thing happens. The bichromated gelatine has been rendered quite insoluble by the action of the light in certain parts, and those parts comprise the lines of the drawing. The rest of the surface is still soluble in the hot water, and immediately begins to dissolve. In a very few minutes this stage of the work is complete, and the original drawing stands revealed in insoluble lines covered with greasy ink. A zinc plate is now required, to the surface of which that greasy image can be transferred. The zinc is then placed in an acid bath, so that the metal, where not protected by the ink, is eaten away—and lo! the drawing is left in relief. This zincographic plate can now be mounted on a wooden block for direct use in the printing-press, or it can be employed for affording wax moulds from which any number of electros can be obtained. It need hardly be said that the cost of producing such a block is a fraction of the cost of one cut by hand.

We see, then, that a printing surface which can be used in the ordinary printing-press is obtainable by the action of light, coupled with certain chemical and mechanical operations, but dispensing from first to last with the work of the engraver. But the picture must be expressed in either lines or dots, or a combination of both, so that innumerable points are produced to which the printing-ink can attach itself. Many attempts have been made to soften the effect of these markings, so as to get some appearance of half-tone. The best method, perhaps, is that which employs a special form of paper for the original drawing. Specimens of such prepared

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papers are now before us, and they exhibit a wonderful amount of ingenuity in their manufacture. Here is one faced with a surface of china clay. Upon this surface is described a series of close parallel black lines, such as a wood-engraver would employ on a block to indicate a blue sky. These lines are in relief, so that, as an artist executes his drawing upon the paper in soft lithographic chalk, the lines catch hold of the black composition and retain it, forming eventually a network of microscopic dots, which will readily lend themselves to the requirements of the zincographic process just detailed. But the paper can do more than this. With a scraper or knife the artist can work upon the surface, so as to cut away the lines, leaving pure white underneath. The white scraped portions then indicate the high lights of his drawing, the chalk-marks represent the deepest shadows, while the untouched lined surface of the paper affords the half-tones. Other effects can be produced by using grained papers of different kinds, and ordinary chalk drawings on paper can be well imitated for production in the printing-press by these methods.

The production of "process blocks," as they are called, to distinguish them from wood engravings, is now becoming a very important branch of commercial enterprise. Broadly speaking, we are bound to admit that very few of these blocks equal in beauty a fine wood engraving. But the attention of inventors has been aroused to the importance of the work, and new processes are constantly being brought forward. In the hands of Angerer of Vienna, Goupil of Paris, Meisenbach in this country, and many others, some very beautiful results have been already achieved. It is evident that perfection is not far off. In this brief notice of a new but important phase of photography, we have been necessarily confined to bare outlines. It may be said, however, that all these processes depend in the first instance upon the fact that certain chemical salts render gelatine insoluble after exposure to sight. This important discovery was made by Mungo-Ponton so long ago as the year 1839.

MIND ACTING ON BODY.

By RICHARD A. PROCTOR.

WHAT might be hoped from minds of exceptional power we may learn from several instances which have been recorded in the history of medicine. Among the most remarkable is the case of Andrew Crosse, the electrician—a case so remarkable, indeed, that, were it open to doubt, one might be disposed to reject it as incredible, or at any rate as explicable in any other way than as an instance of the power of the mind over the body.

Crosse had been bitten severely by a cat, which on the same day died from hydrophobia. He seems resolutely to have dismissed from his mind the fears which must naturally have been suggested by these circumstances. Had he yielded to them, as most men would, he might not improbably have succumbed within a few days or weeks to an attack of mind-created hydrophobia—so to describe the fatal ailment which ere now has been known to kill persons who had been bitten by animals perfectly free from rabies. Three months passed, during which Crosse enjoyed his usual health. At the end of that time, however, he felt one morning a severe pain in his arm, accompanied by severe thirst. He called for water, but "at the instant," he says, "that I was about to raise the tumbler to my lips, a strong spasm shot across my throat; immediately the terrible conviction came to my mind that I was about to fall a victim to hydrophobia, the consequence of the bite that I had received from the cat. The agony of mind I endured for one hour is indescribable; the contemplation of such a horrible death—death from hydrophobia—was almost insupportable; the torments of hell itself could not have surpassed what I suffered. The pain, which had first commenced in my hand, passed up to the elbow, and from thence to the shoulder, threatening to extend. I felt all human aid was useless, and I believed that I must die. At length I began to reflect upon my condition. I said to myself, 'Either I shall die or I shall not; if I die, it will only be a similar fate which many have suffered, and many more must suffer, and I must bear it like a man; if, on the other hand, there is any hope of my life, my only chance is in summoning my utmost resolution, defying the attack, and exerting every effort of my mind. Accordingly, feeling that physical as well as mental exertion was necessary, I took my gun, shouldered it, and went out for the purpose of shooting, my arm aching the while intolerably. I met with no sport, but *I walked the whole afternoon, exerting at every step a strong mental effort against the disease.* When I returned to the house I was decidedly better; I was able to eat some dinner, and drank water as usual. The next morning the aching pain had gone down to my elbow, the following it went down to the wrist, and the third day left me altogether. I mentioned the circumstance to Dr. Kinglake, and he said he certainly considered I had had an attack of hydrophobia, which would possibly have proved fatal had I not struggled against it by a strong effort of mind."

It seems to me not unlikely that this case, besides illustrating the power of the mind in arresting disease, might serve, if carefully studied, to throw light on the nature of hydrophobia. We must assume, it should seem, that the mind can only act on the body by means of the nerves, which indeed may be regarded as simply outlying branches from the grand nerve-trunk—the brain. By strong mental effort the nervous system, either as a whole, or in some special region, is thrown into some condition which is not its normal condition, and in this abnormal state influences in some special manner the other tissues, either of the body as a whole, or of the part of the body in which the nerves are thus thrown into an abnormal state. Now, it seems by no means impossible to ascertain experimentally what is the change of condition thus brought about by mental efforts to direct attention to special parts of the body. The recognition of the possibility that the progress of the hydrophobic disease in the body may be arrested by interposing in its way, as it were, a barrier of nervous system in this abnormal condition might conceivably suggest some specific remedy for the disease, some process or medicament by which this abnormal condition might be brought about in cases where the mind and will were not sufficiently powerful to produce such an effect without aid from without.

Remembering the resemblance between some of the phenomena of hydrophobia and of lock-jaw, the following case, in which the cure of lock-jaw was attributed to the use of metallic tractors, further illustrates this particular point, for it was sufficiently demonstrated subsequently that all the results of metallic tractorism could be equally well produced with wooden or bone tractors painted to resemble metallic ones—in other words, that they were simply effects of imagination, strongly excited by the belief that metallic tractors have a powerful curative influence. The account is given by the late Mr. John Vine Hall, of whom Dr. Todd remarks that his veracity was unimpeachable:—"Mrs. P., a poor woman in Wharf Lane, Maidstone, was seized with a lock-jaw four days ago, and continued in a most deplorable state, attended by a physician and a surgeon, till this morn-

ing, when she was completely cured in fifty minutes by the application of the tractors. The medical gentlemen had been exerting themselves to the utmost, in the kindest manner, and one of them said he would give a hundred guineas if he could save her life. This gentleman came into the room while I was in the act of using the tractors, which he had never seen before, but kindly said they should certainly have a fair chance, and he directed me where to apply them with the greatest advantage. I continued the operation for forty minutes without any apparent benefit, and then, giving the tractors into the hands of the surgeon, returned to my own house, awaiting the issue of their further application. In about twelve minutes the surgeon (Mr. S.) came breathless with haste and delight to inform me that he had himself continued the use of the tractors only ten minutes when the poor creature opened her mouth. Mr. S. was so fully persuaded of the efficacy of the tractors that he immediately purchased a pair for his own use. Mr. S. writes: 'The case is yours, the suggestion was yours; I merely continued the employment of the measure from the apparent helplessness of medical means in relieving the distressing complaint. Although previously to the employment of the tractors I had utterly given up the idea of saving my poor patient; although I feared medicine would prove wholly inefficacious, yet I am not prepared to say that certain death would have been the result; but I do not for a moment mean to impeach the effect of the tractors in this case. I feel conviction that they produced the cure.'"

In passing I may note, with Dr. Todd, my surprise that after it had been conclusively proved by the experiments made by Dr. Haygarth and others with wooden tractors, that such cures as the above were really due to the effect of imagination, they should therefore have ceased to pay further attention to the matter. The result of their experiments was more interesting than would have been any demonstration of the potency of metallic tractors. They had established, in fact, the existence of a curative power in nature far more wonderful, and promising to be of far greater, because of far wider, utility than those mystical instruments. Yet, having effected this great discovery, they treated it as if it were of no value whatever. Are we to suppose that if, when death was gradually approaching nearer and nearer to Mrs. P. of Maidstone, S. the surgeon and Vine Hall the tractorian, had known what was afterwards established by Haygarth and others, they would have declined to use the means by which (through the influence on her imagination) the poor woman was actually cured? The conduct of Haygarth and the rest, after the efficacy of metallic tractors had been disproved, suggests that this would have been the course of medical men acquainted with Haygarth's results. In other words, having proved that a certain very potent method of cure derives its power from a source other than had been supposed, doctors seem to have agreed that therefore this remedy should no longer be employed, though the very researches by which they had detected the true nature of the remedy had at the same time indicated its wonderful efficacy. It is as though a physician, called in by a family doctor to counsel him about a patient, should suppose that a certain medicine which had proved of great service before his arrival contained quinine; but finding on analysis or otherwise that it contained other ingredients, and no quinine at all (satisfying himself, also, in the meanwhile, from observation, that it was of great service to the patient), he should incontinently throw the bottle out of window. This, as Dr. Todd well remarks, "is at least as astonishing as that the public should believe in, and allow themselves to be cured by, the metallic tractors of Perkins, and be content to refer the influence to galvanism."

The case of Irving preaching under an attack of cholera, and actually overmastering that terrible disease in the struggle, is perhaps familiar to many of my readers. But it so remarkably illustrates my subject that I can ill afford to omit it. During the cholera season of 1832, he was seized with "what was in all appearance, and to the conviction of medical men when described to them, that disease which had proved fatal to so many of our fellow-creatures." He had risen in perfect health. But by breakfast-time he had become very cold, and was in great agony. The usual symptoms of cholera presently supervened. A medical man informed Dr. Todd that to his knowledge Irving was in a state of dangerous collapse during one part of the morning. "With sunken eyes, pallid cheeks, and an altogether ghastly appearance, he tottered to the church, a quarter of a mile distant, and found another minister officiating for him." He was tempted, he tells us, to turn back, but summoned resolution to send a message to his brother-minister that he would shortly take his place. In the meantime he stretched himself on three chairs in the vestry before the fire. "Even as I shifted my position," he said, "I endured much suffering, and was almost involuntarily impelled to draw up my limbs in order to keep the pain under. Nevertheless, when I stood up to attire myself for the pulpit, and went forward to ascend the pulpit-stairs, the pains seemed to leave me." With dimmed sight, his head swimming, and his breathing laboured, he grasped the sides of the pulpit, and looked wistfully around, wondering what was to follow. Be it remembered that in his eyes disease was sin; faith only was needed to overcome all other bodily ills save those due to accident or old age; and that disease seemed now likely to master him was evidence, as he thought, that he had sinfully lost hold of faith. It was a moral struggle (at least, it seemed so to him), not a bodily contest in which he was engaged. As he thus stood contending against the evil spirit in imagination, but in reality bringing by strong effort of the will his natural energies to meet the progress of physical disease, the crisis came. In an instant "a cold sweat," he tells us, "chill as the hand of death, broke out all over my body, and stood in large drops upon my forehead and hands. From that moment I seemed to be strengthened." For more than an hour he preached with a fervour unknown to him—fervid preacher as he ever was before. He walked home, eating little. In the evening he preached in a crowded schoolroom, and next morning rose before the sun, strong and hearty as before the attack.

An agency competent, as these and many similar cases which might be cited seem to show, to check the progress of such maladies as hydrophobia, lock-jaw, and cholera, is one which deserves to be dealt with, not as an interesting illustration of psychological and physical relations, but as a potent remedial force worthy to take its place beside, if not above, any of the medicaments which doctors are at present in the habit of employing. But apart from this, the circumstance that powers so remarkable exist in the cerebral faculties suggests other purposes to which they might be applied. In the phenomena of hypnotism, or artificial somnambulism, we have some very striking evidence on this point; but it would lead us too far from our present subject to consider these, except so far as they illustrate the influence of the mind on bodily disease. In this respect they supply some of the most remarkable evidence we have to consider.

Let it be premised before considering the phenomena of hypnotism, mesmerism, or whatever we choose to call them, that the theory of their being due to animal or any other sort of magnetism has been abundantly disproved. Of course, if it were otherwise, they would fall entirely outside the range of this essay. Nor, again, can they be in any way attributed to the influence of one mind on another, except in

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the way of suggestion. The cure of the naval officer already considered might be attributed in *this* sense to the action of the surgeon's mind on the patient's body, for it was the ideas advanced by the surgeon which excited the necessary action in the mind of the patient whereby the progress of disease in his body was checked. But as in that case the immediate remedial agent was (if the case was interpreted correctly) the mental action of the sufferer, so all the phenomena of hypnotism are due to cerebral processes in the subject, these processes being simply initiated by the suggestions, more or less obvious, of the operator. I have said that the magnetic interpretation has been disproved, and equally it can be asserted that the supposed influence of the operator's mind on the subject's body has no real existence. I have not space here to consider the evidence; but full evidence has been obtained that precisely as all the results of metallic tractorism (a special case of animal magnetism, as was supposed) can be obtained with wooden ones, so all the phenomena attributed to animal magnetism generally can be obtained without any magnetic influences, while the phenomena which had seemed to be excited by the active will of an operator are obtained in equal degree when he purposely diverts his thoughts to other matters. The only circumstance remaining unexplained in the phenomena of hypnotism is the strange power which the subject often possesses, or seems to possess, of reading the thoughts of the operator. But this may probably be regarded as simply illustrating the abnormal powers which the mind of the hypnotised possesses for the time being; and indeed it is certain that the power of mind-reading acquired at such times (probably, merely the power of recognising minute changes of expression, attitude, gesture, and so forth) is by no means limited to the operator; in some of the most remarkable and the best-attested instances the hypnotised person has been able to read the thoughts of any person to whom his attention has been directed.*

Setting aside, however, all explanations based on hypotheses inconsistent with the known laws of physics, or on impressions supposed to be produced by one person's mind on another person's body—in fact, all such explanations as science is bound to reject—we find in the phenomena of hypnotism the most wonderful illustrations of the power which the mind has over the body. We might consider here a number of cases illustrating the cure of paralysis and affections more or less obviously depending on the state of the nervous system; but it will be better to limit our attention at present to the far more striking cases in which a definite change has been produced in the condition of parts of the body which might be supposed altogether beyond the mental influence—that is, so far as their organic structure was concerned.

In relation to one remarkable case of the former kind described by Dr. Procter, of York (see the "Zoist" for 1851), in which the patient was averse to the trial and expected no result, whereas the cure was as complete in his case as if he had been full of faith in the magnetic passes, it is necessary to make some remarks. The case is not one which need be described here, but the inference that because of the patient's unbelief we must reject the theory that imagination had aught to do with the matter is one to be carefully considered. Dr. Todd has well pointed out that the essential point in these cases is not the encouragement of the expectation of cure, but the direction of the attention to the part of the body which is affected by disease. The unbelieving patient who at the same time is indifferent to the experiment would doubtless be an unpromising subject for the mental method; but a patient who took sufficient interest in the passes and other outward signs of mesmerism to be opposed to them, would probably be quite as favourable a subject for the method as one who took the same degree of interest in them because he believed in their efficacy.

The most striking illustrations of the effect of imagination excited, as when hypnotism or Braidism is produced, are those in which partial blindness has been cured, actual opacity of the cornea being removed. Where very weak sight has been quickly cured, we may assume that the weakness was in the optic nerve, or otherwise depended on the state of the nerves, but it will presently be seen that in other cases the structure of the eye has undergone a definite organic change.

To the former and less remarkable class of cases belongs the cure of Mrs. Stowe by Braid. She was forty-four years old, and had used spectacles for twenty-two years, not being able without them to distinguish even the capital letters of advertisements in a newspaper, nor the large heading of the paper. After being hypnotised by Braid for eight minutes she was able "to read both the large and small heading, and day, month, and date of the paper. Her sight continued to improve—she could thread her needle, No. 8, without spectacles;" and Mr. Braid states that this remarkable increase of visual power has been retained.

The case of Miss R. was equally remarkable. She had not only suffered from ophthalmia, but as a result of the partial blindness thus occasioned had met with several accidents, some of which had further injured her eyes, insomuch that she was totally blind. She was placed under the care of a physician at Dublin during six weeks, and improved to some degree, "for the iris had become somewhat sensitive to light, and she was able to discern large objects, but could neither see to read nor write." She returned home, but her eyesight remained without further improvement, and at length her medical attendant recommended that she should be placed under Mr. Braid's care. He found no apparent physical imperfection to account for her impaired vision, nor at this time did she suffer from any pain about the head or eyes. She could not discern a single letter of the title-page of a book placed close to her, though some of the letters were a quarter of an inch long. Having placed the patient in the condition of artificial somnambulism, Mr. Braid "directed the nervous force to the eyes by wafting over them, and gently touching them occasionally, so as to keep up a sustained act of attention of the patient's mind to her eyes and the function of vision." (Some objection must be taken in passing to the statement that the nervous force was directed to the eyes, because it involves an assumption. The attention was directed to the eyes; what intervened between this act and the observed change in the patient's condition is a matter to be inferred, not assumed.) In about ten minutes she was aroused from the hypnotic trance. "I now presented before her the title-page of the same book, when she instantly exclaimed with delight and surprise, 'I see the word "commerce!"' pointing to it. I told her she would see more than that presently, and in a little while she exclaimed, 'I see "commercial,"' then 'I see "dictionary,"' and shortly after, 'I see "McCulloch;"' but she could see nothing more. I told her that after a little rest I felt assured she would see still smaller print; and after a few minutes she was able to read 'London: Longman, Green, and Longmans.' Such

* It would seem, indeed, probable that the special cerebral condition produced in the hypnotised may be excited at will by some persons; without the assistance of any operator they become subjects of their own mental control thus specifically exercised. Some remarkable cases of mind-reading (amongst others may be mentioned two described by Dickens—see Forster's *Life*—as exhibited by a French conjurer at the time of the Anglo-French alliance) seem explicable in no other way, and in this way explicable without any mysterious or supernatural agencies (which are, of course, *ex necessitate*, excluded from the scientific discussion of such matters).

was the result of my first process. After a second hypnotic operation the next day the patient could read, when first aroused, the whole of a title-page of a pamphlet, and in about five minutes after, she read two lines of the text. After another operation the same day she could read the small close print in the Appendix; and was able the same evening to write a letter home reporting progress for the first time for twelve months. She only required two more hypnotic operations, when she was found able to read the smallest-sized print in a newspaper, after which she left me quite cured, and, as I have heard, she continued well ever since."

The explanation in such cases would seem to be unmistakably that indicated by Braid in the expression to which I have taken exception above. By the actions which directed the attention to the act of vision, the nervous force would seem to have been directed along the channels from which some cause or causes had before unfortunately diverted it—the optic nerve and the various ramifications extending from it. These channels of communication between the brain and the eyes having been thus again opened, remained thenceforth as they had been before they had been obstructed. Be it noticed that the words here used—nervous force, channel of communication, obstructed, opened, and so forth—must not be understood in their literal sense; they are simply convenient forms of expression for qualities, processes, &c., about which we know in reality very little.

(*To be continued.*)

HOW THE BIBLE CAME TO US.

By a Student of Divinity.

(*Concluded from p.* 215.)

THE NEW TESTAMENT.

THE history of the collection of booklets which we call now the New Testament is very different in nature from that of the larger collection called the Old Testament. As we have seen, the Jews gradually accepted more and more from among the old works which at first were for the most part rejected: and so such materials as the books of Judges, Samuel, and Kings, disregarded by Hilkiah and Huldah, took their place in the sacred collection; while afterwards the ill-compiled and comparatively unsatisfactory books of Chronicles, Ezra, and Nehemiah were included. Later still other works, some better, some worse, but all wanting in the antiquity which probably was the real secret of the original idea of inspiration, were added to the varied conglomerate.

With the New Testament the case was different. Upwards of fifty gospels existed, from among which four only were selected; many very remarkable acts were attributed to the Apostles besides those recorded in the accepted Acts; all manner of letters, from epistles by Abraham to others equally authentic by Pilate and Mary, and even Christ, asserted claims to acceptance besides those few which bore, more or less satisfactorily, the feeble critical analysis which the knowledge of the second and third centuries could apply.

We have no means of determining with any accuracy the degree of knowledge attained by the Jews before our era; for we see no traces of any process of selection. Everything old and Jewish seemed to them sacred. But, comparing what the Christians of the second and third centuries accepted with what they rejected, we can form some idea, not only of their acumen, but of their knowledge. We see indeed, noting how certain stories which a few centuries before would have been accepted unhesitatingly were sifted out as incredible, that only a moderate advance in knowledge would have enabled them, by sifting out yet other writings, to have saved some modern theologians an immense amount of trouble and some twinges of conscience (we may well hope) in the painful work of reconciling nescience with knowledge and inconsistent narratives with each other.

For this reason, as giving us a measure of early Christian critical ideas, we may as well, in the first instance, consider the nature of the rejected works, of which it has been justly remarked that they contain much which might easily be reconciled with the contents of the received books, though (happily or unhappily, according to the point of view one may adopt) they also contain a great deal which even the most advanced theological ingenuity would probably be unable satisfactorily to explain.

In one gospel we have an account of the childhood and early life of the Virgin Mary. It would appear from this record that, at the age of three years, the little lady was brought to the Temple, and accomplished the quasi-miraculous feat of walking up the steps without help. The choice of Joseph as Mary's future husband was determined by a dove, who came down from heaven (where doves, it is well known, have their home, and where marriages are made) to announce the selection of the carpenter of Nazareth as her spouse. In the Gospel of the Infancy we have two stories of the childhood of Christ, which even in those uncritical days must have seemed *par trop fort*. At the age of five, he amused himself one day moulding clay birds; being chidden for this, he gave them life and they flew away. This use of means towards an end which, since it was eventually obtained by a miracle, might as well have been attained by a single miraculous effort, reminds one of the blind man cured by clay and saliva, who (unless these are supposed to have a special ophthalmic efficacy) might have been as readily made to see at once. Another miracle of the Infancy reminds us of the fig-tree cursed for barrenness. A boy had beaten the infant; but Jesus, far from omitting to resist evil, caused him to fall dead immediately. The Gospel of Nicodemus gives the names of those who accused Christ before Pilate. We also find that one of the women cured by Christ was called Veronica; and we learn what happened when Christ "descended into hell."

The record of the acts of the apostles by Abdias, who came immediately after their time, is chiefly remarkable, perhaps, for the account of the contest between Peter and Simon the magician, before Nero. The contest, according to this veracious history, ended unpleasantly for both. The last encounter was a sort of flying-match. Simon floated fairly high at this *séance*, and appeared likely to triumph, when Peter made the sign of the cross, on which Simon became submissive to the customary action of gravity, and falling heavily, broke both his legs. Nero was annoyed at this, for he would seem to have made Simon a favourite, and he therefore caused Peter to be crucified head downwards. No miracle intervening, Peter came thus by his death.

Among the forged letters may be mentioned two by Pilate in singularly bad Latin to Tiberius, and several by Christ, including one written to Abgarus, King of Edessa, which must clearly have been miraculous, since there was no king of Edessa in Christ's time. There were also letters by Mary, and several passed between Seneca and St. Paul which St. Jerome and St. Augustine were content to receive as authentic.

But in fact the number of forgeries of this sort which appeared in the second and third centuries was enormous. The piously disposed seemed to think they could in no

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better way show their zeal than by lying zealously in the cause they had espoused.

From amidst all this heap of piously intended forgeries the selection of trustworthy material must have been difficult indeed. One is disposed to wonder what a Tischendorf, if a man with knowledge and acumen such as his had existed in those days, would have made of the task. The Hilkiahs, Shaphans, and Huldahs of old had simply to form an opinion about documents whose origin and greater or less antiquity they were acquainted with. Ezra and Nehemiah had a similar task, and not being so exacting accepted more, while in later ages nearly everything Hebrew was accepted as sacred until close upon the fall of Jerusalem. But those who, in the second century of the Christian era, had to determine what was good, indifferent, or bad, in the immense mass of stories which so many (as the author of the third gospel tells us) had "taken in hand to draw up," had a much more difficult task.

We have in reality no trustworthy evidence as to the real authorship of any of the four gospels, or of the Acts; for even the internal evidence, such as it is, is questionable, on account of the prevailing taste for literary forgery. Those who first tried to draw up anything like a canon of the New Testament were neither very critical nor very learned; and if they were able to form an opinion as to the authorship of some original form of any one of the gospels, they would yet have been quite unable to distinguish between the genuine text and interpolated matter.

The study of a single book may suffice to show what knowledge the critics of those days had and had not. There is a tradition that the Gospel of Matthew was originally written in Hebrew, but there is very little evidence, or none at all, in its support. A peculiarity of the author of this gospel, whoever he may have been, is his anxiety to devise fulfilments of misunderstood prophecies. He was misled by the redundancy of Hebrew poetical expression resulting from the recognition of something especially beautiful in repeating the same idea in different words, or in the same words variously arranged, as in the lines—

> At her feet he bowed, he fell, he lay:
> At her feet he bowed, he fell:
> Where he bowed, there he fell down dead.
>
> *Judges* v. 27.

This peculiarity belongs to the earlier stages of poetical development, and is especially characteristic of the poetry of semi-savage races.* But the writer of the first gospel was not aware of this, so he deemed it necessary, for the conversion of the Hebrews to Christianity, to present Christ as not only entering Jerusalem on "an ass," but also moreover on "a colt, the foal of an ass" (the method not stated); whereas the author of the second gospel is content with the colt alone. It should be noticed, however, that it is the author of the fourth gospel who thought it necessary to show how not only were Christ's garments parted, but lots were cast for his vesture, a rendering which (apart from the mistaken idea about prophecy being intended) would probably have much surprised the ancient poet who lamented among other griefs the abstraction of his clothing.

It was also the author of the fourth gospel who recognised in the saying, "a bone of him shall not be broken," a prophetic indication of death rather than of safety! It was, however, the author of the first gospel who made the most grievous mistake of all—a mistake unintelligible unless we remember that an illiterate Hebrew, even though he might have heard the greater part of the ancient scriptures read often in the synagogue, would remember only scattered verses, not their context. Anyone who reads Isaiah, chapter vii. verses 11 to 17, and chapter viii. verses 3 to 8, will see that the words, "Behold, a virgin shall conceive," &c., though they related to a "sign" and purported to convey a prophecy, related to no such miracle as the incarnation, and conveyed only a prediction about matters which were to follow within two or three years, and did so follow according to the prophet's account. One who was then a virgin was to become presently a mother, precisely as many maidens of to-day will in the ordinary course of events be mothers before this day twelve months. The child was to be called Immanuel; and he received that title, besides the less euphonious names Maher-shalal-hash-baz; and before he had knowledge to cry, "My father" and "My mother," the King of Assyria was to achieve a triumph, then perhaps somewhat obviously impending. But the writer of the first gospel, with the words of the well-known verses in his memory and the context forgotten, perhaps also with some vague recollection of a tradition belonging to the old and almost universal belief in the birth of the Sun-god from a virgin, supposed the birth of the Messiah was referred to, and spoke of events long after Isaiah's time, as occurring that that supposed prophecy might be fulfilled!

While we may wonder that these blemishes in the first gospel, and kindred errors in the others, natural enough in the writings themselves, should have escaped the carping race of critics, even in the second century, we must not wonder that they noticed none of those mistakes which modern science has detected. Doubtless these were few, and those not likely to be Christians, who, in the first six centuries even, would have noticed the mistake involved in supposing that from an exceedingly high mountain all the kingdoms of the earth could be seen at a single view. Probably there were none, and assuredly there were no Christians, who knew that the phenomena attributed by the writers of all four gospels, as well as of most of the remaining books of the New Testament, to possession by evil spirits, were in reality due to causes purely physical.

On the whole, we may admit that, if any among the multitudinous gospels existing in the middle of the second century were to be retained, the four gospels which seem to have definitely taken their place in the canon of the New Testament before the end of that century were deservedly selected; though it must also be admitted that, while a very slight diminution of critical keenness would have brought in many more, a moderate increase of acumen would, at any rate, have caused the excision of many interesting but questionable passages now remaining in each of the four narratives retained.

The Muratori fragment—if genuine, as seems likely—shows that a sort of canon of the later scriptures had been drawn up a generation at least before the time assigned by the author of "Supernatural Religion" as the earliest date to which the acceptance of the four gospels can be referred. The epistle of Barnabas, though doubtless a forgery, shows that even earlier some of the sayings embodied in the gospels were regarded as scriptural,—though that, of course, is not saying much. Again, we learn from Dionysius, Bishop of Corinth about 170 A.D., that the epistle of Clement had been read in his Church from ancient times; and in this epistle, whose authenticity seems probable, there are many quotations of sayings of Christ, such as are found—though never in the same precise words—in the four gospels. Hermas, Ignatius, Polycarp, and Justin Martyr, ranging in time from the latter half of the first century to the middle of the second century, give corresponding evidence. It may

* For an excellent example of this style, see the song of triumph of Jim, the Australian savage, in "Never Too Late to Mend." "I slew him, he fell; *I* slew him, he *fell*; I slew *him*, *he* fell; and so on. This is the style of the savage. The song of Deborah and Barak is a fuller development of the same method.

be urged that as they never use the exact words of the now accepted gospels, their evidence is rather against than in favour of the belief that these gospels were accepted in their day. But it may fairly be answered that in those days exact quotation would be the exception rather than the rule. It must, however, be admitted that, even if this would explain their *never* quoting exactly, there is simply no evidence in these letters in favour of the accepted four gospels as against (1) the rejected ones, or (2) the possible existence of others long since lost, or (3) even the existence of old Hebrew records of moral sayings of much greater antiquity (mistakenly attributed to Christ). For in any one of these three cases Clement, Hermas, and the rest would have written as they did; while, were they actually quoting from the accepted gospels, they might have been expected to have once, at least, quoted correctly.

Mr. Matthew Arnold has noted one strange class of exceptions to this incorrect quotation, if quotation indeed it was. He observes that quoted prophecies are given in the very words of the gospels, even when these words differ from those in the Septuagint. It is hardly necessary to insist on the significance of this peculiarity combined with the incorrect rendering elsewhere. We see that the ancient letter-writers actually quoted, and as clearly that they could not have been quoting from the gospels we have, but that in these gospels certain prophecies were quoted from some more ancient record.

With regard to the Epistles and the Book of Revelation, similar difficulties exist. The doubts which long prevailed as to the Epistle to the Hebrews, the Epistle of Jude, the second Epistle of Peter, and the second and third Epistles of John, show that something like the same difficulties which had limited the development of the Old Testament limited also the growth of the New. But with the progress of time, objections clearly recognised by the critics of the second and third centuries disappeared, and when Jerome wrote his Latin version of the Bible—the Vulgate—the doubts which he himself recognised had so far lost their efficacy that the New Testament in his hands assumed practically its present form.

We may hereafter give a sketch of the interesting history of Bible Revisions, and of the somewhat amusing but suggestively instructive opposition which they successively encountered.

A DEAD WORLD.

By RICHARD A. PROCTOR.

(*Continued from* p. 212.)

THAT the stages of the moon's life would be very much shorter than those of our earth's life, follows, as we have seen, from the consideration of her smaller mass. But the stages of her life would not only be shorter than those of the earth, they would be different in character, because of the different amount of air and water, and also because the lunar atmosphere before it became air such as we have (only rarer) must have been very different in quality from our air in its old unbreathable state.

It has been shown by geologists that the various salts found in the sea must have belonged to it from the beginning. The familiar explanation that they were washed into the sea by rivers is no explanation at all: as a matter of fact the substances thus washed down by rivers came to be present in the solid crust by the drying up of former seas. We can form from the constitution of sea-water some idea of the horrible kind of atmosphere which our earth originally possessed. So also can we from many of the substances which we find in the earth's crust. There was sulphurous acid, and sulphuretted hydrogen (savouring of rotten eggs, though it could not have suggested their presence in days before as yet any chickens had appeared), carbonic acid, hydrochloric acid, and other highly disagreeable vapours. We have only to imagine what would happen if our earth were warmed up again, to see what must have been her state before she cooled. Nay, as she is kind enough to warm herself up locally at times, in sufficient degree to emit the very vapours which must of yore have been permanently outside her crust, we can tell by actual observation what they were. As the temperature beneath the earth's crust rises, the following gases and vapours are successively poured forth: carbonic acid gas (which chemists now call carbon dioxide), sulphurous acid, sulphuretted hydrogen, boracic acid, and hydrochloric acid. How pleasant an abode our earth would have been in her youth (independently of her high temperature) for breathing animals, may be inferred from the state of things formerly existing in the Avernian Lake, across which no bird could fly with life. The showers falling from the hot air of those days would be by no means showers of pure water. Boracic acid in the liquid state may not sound very terrible, but boracic acid has played the very———a very important part, we would say—in modifying rock substances in volcanic districts, and when it fell in showers must have greatly altered the character of the earth's hot crust. Sulphurous acid might be as innocent as rose water for anything that its name may perhaps imply to many; but when we speak of fiery hot vitriol, everyone begins to recognise a substance that would probably have produced somewhat more marked changes on the hot crust of the earth than would a drizzle of ordinary rain on the fields and plains of the earth to-day. Ammonia and various compounds of carbon, nitrogen, and hydrogen, must have been present in the old atmosphere of the earth, and in various degrees of dilution with water must have been very effective as denuding agents.

Now it is easily seen that the various stages of the earth's vulcanian history must not only have been very different from those of the moon's, but that the records left in the crust must have been very differently treated. For example, the formation and the active existence of great volcanic craters on the earth probably preceded the formation of great mountain ranges. (I am not here referring to the various steps in the formation of a mountain range, but to the era of mountain forming as distinguished from the era of great crater formation.) On the moon there seems to have been no great era of range forming, and such mountain ranges as were formed probably began and ended their careers while the great craters were still active. But not only do we thus find a very different relation existing between mountain ranges and great craters on the moon and on the earth respectively, but we find that the records of the two forms of crust disturbance are in a very different state. On the earth all the original great craters have been so worn down and denuded that nothing but their basal wrecks remain; on the moon the great craters show their vast dimensions as originally formed, or where we see signs of important changes, the changes are those produced by subterranean not by subaerial action.

All this is readily explained as soon as we note the natural results of—1st, the relative shortness of the stages of the moon's life; 2ndly, the smaller relative quantity of water; and 3rdly, the smaller relative quantity of air.

The earlier forms of volcanic disturbance on the moon would resemble closely enough, in all probability, those which took place in the corresponding parts of the earth's

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history. Doubtless the earth had large craters like those which still remain in the moon. But then in the earth's case there has been a much more thorough wearing down of those upraised regions. There has been more water to do the work by sea action, by river action, and by glacial action; there has been more air to help in the work by the action of rain, wind, snow, and storm; and there has been much more time for all these processes to take effect. Similar considerations apply, indeed, to the earlier stages when our atmosphere was denser, more complex, and more destructive alike by its own action and by the action of the various fluids formed by condensation out of the unpleasant vapours present in it. Now even a planet cannot at once eat its cake and have its cake. If our earth has had water enough, air enough, and above all time enough, to wear down in great degree the records of the first stages of its vulcanian career, the immense outbursts of molten matter, the vast craters, the mighty wrinkles and corrugations, then naturally these records can no longer exist in their original dimensions on the earth. But it is equally clear that the corresponding records will remain on the moon, where there has been much less water, a far rarer air, and a much shorter time during which denuding forces of air and water could work.

We can at once see a reason then why on the moon the immense craters which are much earlier vulcanian products than mountain ranges, remain still extant. Many of the larger and older ones show signs of denudation, which we may probably regard as having been brought about when the moon's atmosphere was still in its early state, loaded with active acids, still intensely hot, and capable of producing marked effects on the intensely heated crust. But far the greater number of the lunar craters are manifestly in the state in which they were first formed. The denuding forces on the moon died out long before there had been time to wear any but the earliest craters down, or wholly to wear down any.

On the contrary, there are naturally few mountain ranges of great size on the moon. The mountain ranges are products formed out of the materials of previous formations; and if the great craters remain, or have been very little reduced by denuding action, it follows that there has been very little material available for mountain-making, and few mountain ranges therefore have been formed.

Still, the great range of mountains called the Lunar Apennines shows that we must consider mountain-making on the moon in some degree, unimportant though this part of the moon's vulcanian history may be, compared with the corresponding part of the earth's. We may expect to find that the great craters have in some degree been worn away to provide materials for that lofty range of mountains. And if we assume, as we fairly enough may, that the formation of the Lunar Apennines corresponded with the formation of terrestrial mountain ranges, then we may reasonably look for the traces of just such processes as geologists have recognised in the development of the Alps, Rocky Mountains, and Himalayas on the earth.

It will be found that the search for such evidence leads to some very curious results, not only justifying the belief that the Lunar Apennines were formed like the terrestrial mountain ranges, but enabling us to interpret features of the moon's globe which hitherto had remained unexplained.

In the first place we find the Lunar Apennines between two immense plains, the so-called Sea of Serenity on the east (or what would be the east to a lunarian), the so-called Sea of Showers on the west, each having an area of many hundreds of square miles. These great plains are manifestly great tracts on which finely divided matter has been deposited, as on a desert region like Sahara, or—more probably—as on the floor of a great sea. Regarding them as originally oceans, we see that the mountain range occupies such a position as would correspond with the formation of mountain ranges, as this process has taken place on the earth. We may suppose then that the matter out of which the Lunar Apennines were formed was deposited in a great troughlike depression, formed along a region where the crust had yielded in a far earlier stage, and whence molten matter had been extruded. Judging from the height of the Lunar Apennines, we see that the depth of sedimentary matter deposited in that depression, as it slowly sank below the level of an ancient Lunar Sea (originally extending over the whole space occupied by the Seas of Serenity and Showers), must have been several miles. This range then assuredly speaks to us of many hundreds of thousands of years, during which the waters of a vast sea beat on the shore lines of ancient lunar continents, receiving from lunar rivers the matter worn from those continents by lunar winds, and washed down by lunar rivers. (Of one of these rivers, the immense mouth can still be recognised not far from the great crater Plato on the east of that great lake.*)

The steady sinking of the sea floor all round the immense seam thus formed gradually pressed the matter deposited in a troughlike depression into the form of a ridgelike elevation. (The reader anxious for technical expressions—which have the advantage certainly of giving the appearance of much learning at a very cheap rate—may speak here, if he likes, of subclinal and anticlinal; but the actual shapes are perhaps as well indicated by speaking of troughs and ridges.) We may well believe that intense heat was developed in the process, and much of the sedimentary matter metamorphosed into crystalline rock. That the original summits of the elevated ridge were domed or rounded seems altogether probable. That the summits are now no longer rounded is clear from the shapes of the shadows cast on the floor of the surrounding plane when the sun is rising in the lunar east. Here, then, is clear evidence of denuding action continuing long after the ridge had been, as it were, shouldered out of the seas by the side pressures of the sinking sea floors on either side.

On this occasion, then, or rather during this special stage of the moon's history, the denuding processes went on long enough, and with sufficient energy, to do such work as took place many times over during the past history of our earth. "The hills are shadows, our poet sings, and they flow from form to form and nothing stands; like mists they melt, the solid lands, like clouds they shape themselves and go." On the moon a poet would hardly have used such a comparison, even if any poet on the moon ever came to know so much of the past of his world as we have just indicated. For unquestionably the lands on the moon did not melt away like mists, but once only gave enough of their substance up to form one set of mountain ranges. The lunar poet could not echo the terrene poet's exclamation, "Oh earth, what changes hast thou seen;" once, and once only, he would have to admit, "hast thou, oh moon, seen change." Yet for the rest he might have sung (millions of years ago) with the Tennyson of our later world, "There rolls the deep where grew the tree; there where the loud street roars" (if ever they had loud streets in lunar cities), "hath been the stillness of the central sea."

But even of one such change the traces should remain.

* We use the words "east" and "west" the reverse way from that employed in lunar maps. Picturing the moon as a planet, and comparing the processes taking place on her surface with those taking place on the earth, it seems reasonable to speak of east and west on the moon as we speak of them on the earth, not (as our maps of the moon do) as we speak of them on the skies—for example, in speaking of a constellation.

If the floors of the great seas around the Lunar Apennines have been covered with matter washed from the lunar continents, we may look for the signs on those floors, now that the great deep has retired from them (to deeper depths), for traces of the continents over which the waves of those seas once rolled. Such signs, though they have been little noticed, are clearly to be seen. There are the ghosts of great craters—craters which once stood out above the continental tracts to which they belonged, but have now been silted over until, like the forms of objects buried beneath a deep and level snowdrift, they show only through some slight difference in the texture of the sediment lying over the raised parts of the hidden surface. These buried craters were as large as any still outstanding. They tell us of stages of the moon's vulcanian life earlier than those of which the immense extant craters speak. And even these, the mighty Tycho, 54 miles across and 12,000 feet deep, Copernicus, 58 miles across, Kepler, Archimedes, Plato—these speak of a stage of vulcanian activity such as once existed on the earth, but of whose progress the material records were destroyed millions of years ago.

EVOLUTION OF LANGUAGE.

By ADA S. BALLIN.

V.—FAMILIES: THEIR DIFFERENCES AND SIMILARITIES.

IN concluding my last article, I spoke of the slow growth of language as being due to the slow development of mind and acquirement of new ideas. In its early history the progress of language must, however, have been infinitely slower than at any later period, and its progress may be compared to that of a stone falling down a well with an accelerating velocity, which is trebled in the second second, multiplied by five in the third, by seven in the fourth, and so on; for, as I have already shown, the growth of language is primarily dependent on that of ideas, while, on the other hand, ideas are mainly developed by the use of language. Hence it becomes easy to understand how tardy was the early development of ideas when we consider the probably very imperfect language of primitive man. The human contemporaries of the great mammoths whose remains are found in the Post-Tertiary Drift, the men of the bone-caves, of the shell-heaps, of the peat-bogs, and those of the cromlech periods and early lake dwellings, must have lived for untold ages in far greater barbarism than any that can come beneath our ken. Progress must have crept on through the centuries, though with gradually increasing velocity, but tending always to a more coherent communal life, and consequently to an increased need of the means of communication. One of our greatest thinkers has said:—"There cannot be moral relations apart from society. . . . The intellect and the conscience are social functions. . . . The language we think in and the conceptions we employ, the attitudes of our minds and the means of investigation, are social products determined by the activities of the collective life. . . . We breathe the social air: since what we think greatly depends upon what others have thought," * and the most important product of communal life, the means by which man influences and is influenced by man, the very basis of society, is language. The gregarious nature of mankind renders it an imperative necessity, and wherever primitive men may have herded together, in however small numbers, there language, whether of signs or sounds, most probably both, must have sprung up—crude and limited though it may have been, the earliest manifestation of the great organ of civilisation was then called into existence.

"Language," says Professor Sayce,* "was not created until the several types of race had been fully fixed and determined. The Xanthocroid and the Melanocroid, the white Albino, and the American Copperskin existed with their features already fixed and enduring before the first community evolved the infantile language of mankind," but this seems open to the objection that it is too much to assume, for, as I have shown, gregarious animals have means of communication, and it would be unreasonable to maintain that the earliest men were not on a higher level than their four-footed contemporaries.

There are many theories to account for the largely different forms of language used by different races, and as many theories to account for certain similarities among them. In the first place, the differences have been quoted by some writers to prove the distinct origin of races, while others attributed the wide differences to phonetic changes and to the early separation of the human family. In the second place, the similarities can be accounted for either as evidence of the common origin of races or simply as a result of the similarity of physiological construction, especially of the vocal organs which permit of imitation of those sounds of nature which are common to all time and locality. Take, for example, the sound of the wind among leaves, running water, the crackling, roaring, and hissing sounds of burning materials, as well as the noises of animals and birds, and many others. From this it follows that languages would not necessarily be more varied than at present if each family into which we classify them had been derived from different original parents, and there is every reason to suppose that, as Sayce observes in another place, "the primitive languages of the earth were as infinitely numerous as the communities that produced them." But numberless communities have grown up and perished and left not a wrack behind, and it must have been the same with languages. Not only have languages perished with the speakers, but they have also been supplanted by conquering tongues, and, in a manner, killed at the sword's point. Not many years have passed since the last Tasmanian died, and with him the four Tasmanian dialects which our colonists found on their arrival became extinct; but, although the Welsh and the Irish peoples are alive and vigorous, their languages are dying out, supplanted by the English tongue.

Languages are classed in different families according as they can be traced to the same stock. Thus we say that English, French, German, and Hindustani all belong to the Indo-European family, although to different branches of the same; that Hebrew, Chaldee, Arabic, are sister-tongues, for they bear evidence of the strongest possible family relationship. But there are languages which, to continue the metaphor, are orphans and the only survivors of whole families, large or small, that have become extinct. Such are Etruscan, Basque, and the isolated languages of the Caucasus that seem to have no relations or friends in the world.

According to Friedrich Müller there are about a hundred different families of languages in existence between which no relationship has been established, although countless efforts have been made in this direction; and Sayce gives

* G. H. Lewes's "Problems of Life and Mind," vol. i. p. 173.

* "Introduction to the Science of Language," vol. ii. p. 318.

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a list of seventy-six families in which due attention is paid to collateral branches.*

Comparisons between various languages have been made times out of number for the purpose of proving them to be related, which have been based on a resemblance of sound. Thus, it has been argued, English and French are derived from Hebrew, because the word to *cut*, French *couteau*, a *knife* or *cutting* instrument, are akin to the Semitic forms, *katsats*, *khatsats*, *ka'sa's*, *gazaz*, *gazah*, *gazam*, *gaza'*, *gazal*, *gazar*, *khadad*, *gadad*, *kadad*, *gadah*, *khatsah*, *katsa'*, *katsar*, *ca'sakh*, *ca'sam*, which all give the idea of cutting; and similar fallacies have for centuries been popular; but, as I have already shown, this would prove only the imitative power of mankind, and does not of necessity prove any common origin. Scientific philology, a product of quite recent times, has, however, revealed the fact that most essential differences exist between those great families of language of which we have knowledge, and very striking results have been obtained especially with regard to the so-called Aryan or Indo-European and Semitic groups.

The Chinese language, belonging to the Turanian family, is, for a cultivated tongue, perhaps the most ideally primitive with which we are acquainted. Chinese civilisation and literature are among the oldest, if not *the* oldest, in existence; some of the odes of the Shiking dating as far back as 2000 B.C., and they presuppose many centuries of culture. The age of a language may be gauged by the extent to which it has been affected by phonetic decay, and Chinese, especially in the Mandarin dialect, shows many signs of this. Owing to this decay, words formerly distinct come to assume the same form. This happened in Chinese, and in order to distinguish between the different meanings of the same words, tones were introduced, that is to say words were pronounced with a different inflection of the voice in their various senses. There are now eight tones, but only four are in common use. I cannot tell Edkins's authority for making the statement, but if, as he says, it takes about twelve hundred years to produce a new tone, the fact of the existence of no less than eight says much for the antiquity of the language. The Chinese language possesses only about 500 words without reckoning these *tones*, the addition of which, giving different meanings to the same words, raises the number of word-meanings to 1,500. Chinese words represent ideas in undefined forms and are equally convertible into verb, adverb, or noun; thus *ta* contains the radical idea of greatness, being great, and may be used as a substantive, *greatness*; verb *to be great* or *make great*, *magnify*; and as an adverb, *greatly*; the meaning in which it is used being apparent from the context and partly by its position in the sentence. It seems reasonable to suppose from what we have seen of the sign language of the deaf and dumb, in which there is no possibility of inflectional changes, and of the use of gestures by savages, to mark and supplement their application of words, that the earliest use of vocal signs or words was thus undefined. We have seen that phonetic variations of a single word may produce hundreds of other words varying in their construction according to the genius of the peoples who use them, and we can, therefore, suppose some such an ideal root word as we meet with in Chinese remaining unchanged among so conservative a nation as the Chinese, taking a verbal form among Aryans and a nominal form among the Semites. Whitney maintains†: "That the first traceable linguistic entities are not names of concrete objects, but designate actions, motions, phenoomnal conditions, is a truth resting on authority that overrides all preconceived theories and subjective opinions," and from what we have already learnt about the natural development of language, the growth of the various parts of speech from such an original form can be readily conceived. The first words would be representations of sensations. "Miaou," the cat, as in Chinese and ancient Egyptian, is the animal heard to produce that sound. *Pat*, the Aryan root significant of flying, is a representation of the sound of wings in motion. To take a modern parallel, our word *green*, literally *growing*, is used as a noun, *greens* meaning *green vegetables*, and in dumb language *grass* is what "grows up from the ground," and the sign of moving the hand gradually up from the ground also signifies *green*.

Long years of patient research have brought philologists to the conclusion that the origin of all Indo-European languages may be found in a certain limited number of roots whence the various words were derived. These roots are monosyllabic, and may be compared to the monosyllabic words of which the Chinese language is composed, and, although they are never found at present in the form which by careful analysis has been assigned to them, it is thought that the ancestors of Indo-European races conversed in single syllables indicating important ideas, but not as yet showing their mutual relations.* These roots are divided into two classes: I. Those signifying position—demonstrative or pronominal roots; II. Those signifying action or quality—predicative or verbal roots.

From the first and smaller class come the demonstrative and personal pronouns, the interrogatives, the possessives, and relatives, and other less important classes, as also adverbs of position and direction. Those beginning with *m* are especially used to denote the subject, those with *t* and *n* more demonstratively, and those with *k* for interrogation. There are but few of them, hardly more than a dozen, including some which are probably themselves derived from one original. They are very simple, consisting either of a single vowel, such as *a* or *i*, or of one consonant followed by an open vowel, as *ma*, *na*, *ta*, *tu*, *ka*.

The other class is very large and shows every variety of the syllable; the roots imply properties and activities presented in natural objects: visible phenomena, motions, and sounds. The following are some such roots shown to have belonged to the original stock, as they are found in most, if not all, Indo-European tongues, *i* and *ga* indicating motion; *ak*, swift motion; *stā*, standing; *ās* and *sad*, sitting; *kī*, lying; *pad*, walking; *vas*, staying; *sarp*, creeping; *pat*, flying; *plu*, flowing; *ad*, eating; *an*, blowing; *klu*, hearing; *dhā*, putting; *dā*, giving; *dik*, pointing out; *tan*, stretching; *skid* and *dal*, cutting; *mar*, rubbing.

Polysyllables seem to have originated in the combination of roots of these two classes for the purpose of defining some idea, as *vaḷmi*, I here eat; *adsi*, thou there eatest; *ma-si*, *I* plus *thou*, equals *we*. Repetition of the root or reduplication was made to represent the completion of the action indicated, as Sans. *dadān*, given, from the root *da*, give, and so on, every new form by analogy becoming the source of a hundred others. It is thus that words signifying different ideas are compounded to represent some idea which embraces both. In the course of time these combinations with the ideas they represent become fixed in the mind, and their origin is obscured or forgotten; then by the process of phonetic decay they may become reduced to apparently simple forms. Thus in English the words to *don* and to *doff* are from earlier forms to *do on* and to *do off*. Our word *vend* is from the Latin *venum dare*, our *blame* from the Greek *blas-phēmein*, and so on.

* See "Introduction to the Science of Language," 1880, vol. ii. pp. 33–64.

† "Language and the Study of Language," ed. 1810, pp. 260–1.

* See Whitney's "Language and the Study of Language," p. 257, *et seq.*

MEN AND APES.

THERE is a way of speaking of the relationship recognised by science as existing between men and apes which requires correction, as tending to encourage a very prevalent but quite incorrect notion respecting the doctrine of descent. By many this doctrine is understood to imply that man is descended from a race of beings identical with some order of monkeys existing in our own day, or at least closely resembling one of these orders. The doctrine of descent does not involve any such teaching, while that special form of the doctrine which is called Darwinism is very strongly opposed to it, because natural selection implies slow development. (The views advanced by Mivart *might* account for the appearance of man as a descendant of some order of apes, because admitting change *per saltum*, and also the actual copying of an old order, in one or more respects, by a new order; but in his "Man and Apes" he certainly does not encourage the opinion that man descended directly from an order of apes resembling any at present existing. Nor does he anywhere indicate, so far as I know, his actual opinion as to the origin of man.)

It does not appear to be commonly recognised that, according to any doctrine of descent not admitting both of change *per saltum*, and of the reappearance of old forms *otherwise* than by reversion (as though nature had certain types, which at any time might be introduced in lines of descent where heretofore they had not been known), no order existing in the present time can be regarded as closely resembling the progenitors of man at a remote era. For, if this were the case, then on the downward line from those progenitors to man there must have been great change by development, while on the downward line from those progenitors to the order imagined there has been by the supposition scarcely any change. But it is incredible that during the enormous interval necessary to develop man from progenitors resembling any present race other than man, another line of descent from those same progenitors should have remained without noteworthy change. This is true, whether we consider the highest orders of the true apes, or some race which, according to the doctrine of descent, is far more remotely related to man. The general conditions involved may be thus presented:—

At any remote time, T years ago, when man had not as yet appeared, let a class including every individual whose blood has *descended* to the existing races of man be called A_1, and let the classes similarly related to other existing orders *sharing* descent from A_1, be called A_2, A_3, A_4, &c., to A_n. Then, by the supposition, class A_1 more or less overlaps each of the other $(n-1)$ classes; but the mistake is commonly made of supposing that either the n classes A_1, A_2, A_3, &c. were identical, or that at least class A_1 included *the whole* of the remaining $(n-1)$ classes and *no more*. And from this mistake arise most of the commonplace and superficial objections to the doctrine of descent. According to the real teachings of that doctrine, while A_1 overlaps each of the remaining $(n-1)$ classes, it must have had a portion not included in any one of these, while any one of the set of classes may have overlapped some of the others, but not all, besides overlapping other classes outside the series, and having also a portion distinct from all other classes. The greater T, of course, the greater would n be.*

The mistake commonly made may be further illustrated by considering ordinary relationships. If I ascertain that a certain family (X) is related to my own, I do not infer that a certain number of generations ago my family were all X's, or that from the X family there may be bred, in a certain number of generations, descendants closely resembling my own family in all its characteristics, bodily, mental, and moral. Again, no one supposes that Malays, Negroes, Esquimaux, or any other race, could, in any length of time, develop into a race closely resembling the Caucasian, though it may be admitted that some inferior races of men may be gradually raised by development to the intellectual level of races at present superior to them. So far from approximating to the superior race in this process (except as to level, supposing the superior race stationary in that respect), the races would probably diverge, for divergence is the rule and approach the exception.

I may add, what is commonly overlooked in speaking of descent, that the farther back we go the greater is the number of progenitors, whether individual ancestors or ancestral races be considered. At any rate, this is true within the limits of ordinary biological research. Nor is the rule in the least affected by the circumstance that a family or race may for a time avoid alliance with individuals outside the family. Supposing even such avoidance perfect, we have only to go to the beginning of the family, as such, to find the law of increase resumed as we pass farther back.

Individual teachers of the doctrine of descent may believe in a small number of primordial forms, and, of course, it is theoretically possible that, as we pass backwards, after reaching a certain maximum in the number of forms, the number would diminish until only a few remained, from which all the present forms have descended. But science

* The case here considered, which is in reality exceedingly complex, may be conveniently illustrated by a simple imagined case:—Let T represent three generations, and consider one family—say, a brother and sister—as corresponding to the race of man in the above case. Suppose there has been no intermarrying in the three preceding generations, so that the pair had four great-grandfathers and four great-grandmothers—in all, eight persons corresponding to class A_1. Now, suppose every couple in the ancestry to have had two children, son and daughter, each of these to have married and had two children, this happening on all lines downwards from A_1. Then it will be found that the pair has ten families of cousins, two first-cousin families, and eight second-cousin families; and these are all the families which share *descent* from the eight great-grandparents of the pair (to pass to third-cousin families we should have to ascend to the fourth generation). Thus there are eleven families in all. Now, if we suppose the eight great-grandfathers, or class A_1, to be all wealthy, or noble, or handsome, or in some respect luckier than the remaining ancestry of the eleven families, then the pair will presumably possess similar superiority. Say they inherit greater wealth, so that the other ten families are of the order of "poor relations," and so, of course, may serve to illustrate the ape tribes—our poor relations among the vertebrates. Now, if the eleven families were in no way connected, it is clear they would have eighty-eight ancestors in all at time T, or in the third generation of ancestors. But it will be found that, being related, as above supposed, they have instead only fifty-six. The two first-cousin families (corresponding, say, to the higher apes) have each eight ancestors, forming classes A_2 and A_3, A_2 not overlapping A_3, but A_1 overlapping, by one-half, both A_2 and A_3. The remaining eight families (corresponding, say, to the lower apes) have each eight ancestors forming classes A_4, A_5. . . A_{10}, A_{11}; and A_1 overlaps one-fourth of each of these classes. It may be noted in passing that we should find in such a case that, though the two first-cousin families might, on the whole, resemble the favoured pair more closely than the other eight would, there would be some circumstances in which the second-cousin families showed closer resemblance—just as Mivart shows that in some features this or that order of the lower apes resembles man more closely than either the gorilla, the orang, or the chimpanzee. I must confess I cannot recognise the force which Mivart finds in this circumstance as an argument against the doctrine of development by natural selection. It is, of course, precisely what we should expect, according to the general doctrine of evolution, which Mivart appears to accept; but it seems to me to make neither for nor against the special doctrines of the Darwinian theory, when due account is taken of the increasing number of relations as well in ascent as in descent.

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has given no evidence in favour of the doctrine that all existent forms so descended, any more than it has given evidence in favour of the doctrine that the whole human race was once represented by two persons. Many believers in the doctrine of descent consider that when life first began on this globe (whether at an epoch or during an era) forms as multitudinous and varied as those now existing made their appearance on the earth. Be this, however, as it may, it is certain that, during the enormous periods over which palæontology ranges, there has not only been no modification from more to less generalised types, but that, as Professor Huxley long since stated, "an impartial survey of the positively ascertained truths of palæontology negatives that doctrine."

INCOMBUSTIBLE THEATRES.

By Henry J. Slack.

IT is strange that theatres continue to be built so as practically to insure their being burnt down before they have been in existence many years, whereas it is quite possible, not to say easy, to render such accidents very improbable. It may be conceded that a theatre will be sure to have in its stage and property departments a considerable quantity of materials easily ignited, and sure to blaze. Even this *might* be prevented, but complete prevention would be too troublesome, and perhaps also too expensive. What ought to be done is to ensure that a blazing up of the readily combustible matter should not be able to ignite the main structure, or any large part of it. All the recent theatrical fires have shown that the arrangements, where any exist, intended to secure this object, fail, and so they will do until wiser principles of construction are acted upon. The spectators' part of the theatre, the auditorium, with its entrances, stairs, passages, &c., ought not to contain any matter that is inflammable, or easily combustible, even if attacked by a large body of flame arising from gas escape, or fiery outburst on the stage or property part. Brick, or stone and iron, should constitute the framework, and where wood could not be conveniently dispensed with, it should be prepared under hydraulic pressure with tungstate of soda, or some such substance, and covered with an incombustible paint. All hangings and seat-covers should be impregnated with the tungstate. The seats should be made soft, with steel springs, or stuffed with the fibrous material made out of iron slag, and known as silica cotton. So far as possible, the stage properties and appliances should be fireproofed upon these principles. At the worst, what would then happen would be a fire that could not, as now, rage in a few minutes to utterly hopeless proportions. In most cases of theatre destruction the gain of a little time would have enabled the building to be saved. With an auditorium constructed as suggested, its materials could not be quickly raised to anything more than a dull, smouldering state, even if a conflagration in the stage part were not soon cut off from it by descent of an iron curtain. All floors, except the stage, might be made of iron and cement, and wood entirely banished from the greater part of the building.

The cost of such a construction might be more than the price of a theatre calculated to perish in less than twenty years of ordinary risk, but it could be insured at a much lower rate, especially if supplied with plenty of pipes containing one of the anti-conflagration fluids, which would be let out as soon as a fire raised plugs of a fusible metal within a few degrees of the boiling-water point. No building can come near the condition denominated fireproof if any large portion of it contains so much readily inflammable matter that within a few minutes of ignition it is converted into a fiery furnace with heat enough to twist iron and crack stone. It surely is not essential to a theatre to be in this condition. The property part is, of course, the most dangerous, but even there steel could replace wood for all framework and supports, and, where space is not so valuable as to prevent it, stores of all kinds should be in a separate building; if not, divided from the other parts by a party-wall.

COMPOSITE PORTRAITS.

THE four accompanying pictures are good illustrations of the method of composite portraiture, advocated long since by Mr. Francis Galton. They were taken last year in America, at the suggestion of Messrs. Brewer & Pumpelly, and are among the earliest American successes in this method.

The object of the method is to portray types, excluding individual peculiarities. Mr. Galton has pointed out that in travelling through a country, peopled by an alien race, the voyager seems to recognise a general similarity among the persons whom he meets, because he is struck by the general characteristics—novel to him—of the race; and so gives less attention to peculiarities affecting individuals than he would were he among faces more familiar. In a similar way, the resemblance which a stranger finds among the members of the same family is explained. Those who being of that family do not much notice its general type recognise the differences which really exist much more clearly, and wonder that any one can see resemblance where they see such obvious distinctions. Composite pictures, in like manner, bring out the characteristics which are common to a race or family, and hide those which are exceptional.

In *Science*, an American paper, from which the accompanying pictures were taken, the following particulars of the construction of the pictures are supplied by Mr. Pumpelly:—

"The individuals entering into these composites were all photographed in the same position. Two points were marked on the ground glass of the camera; and the instrument was moved at each sitting to make the eyes of the sitter exactly coincident with these points. The composites were made by my assistant, Mr. B. T. Putnam, who introduced the negatives successfully into an apparatus carefully constructed by himself, and essentially like that designed by Mr. Galton, where they were photographed by transmitted light. The arrangements of the conditions of light, &c. were such that an aggregate exposure of sixty-two seconds would be sufficient to take a good picture.

"What was wanted, however, was not an impression of one portrait on the plate, but of all the thirty-one; and to do this required that the aggregate exposure of all the thirty-one should be sixty-two seconds, or only two seconds for each. Now, an exposure of two seconds is, under the adopted conditions, too short to produce a perceptible effect. It results from this, that only those features or lines that are common to all are perfectly given, and that what is common to a small number is only faintly given, while individualities are imperceptible. The greater the physical resemblances among the individuals, the better will be the composites. A composite of a family or of near relatives, where there is an underlying sameness of features, gives a very sharp and individual-looking picture.

"It would be difficult to find thirty-one intelligent men more diverse among themselves as regards facial likeness

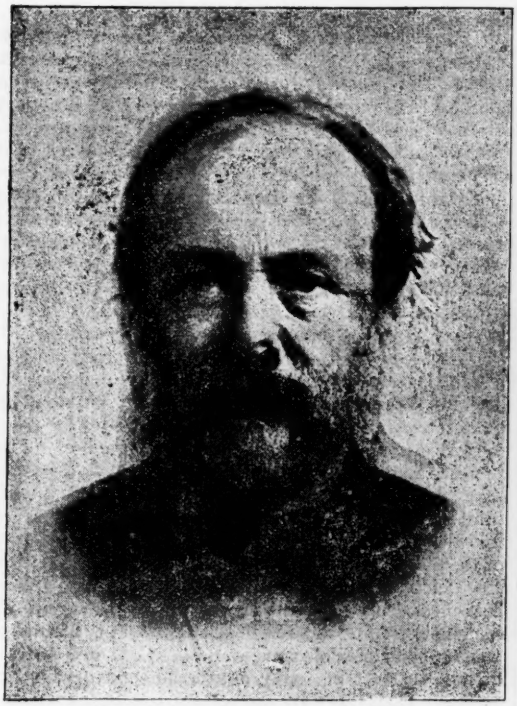


FIG. 1.—TWELVE MATHEMATICIANS.

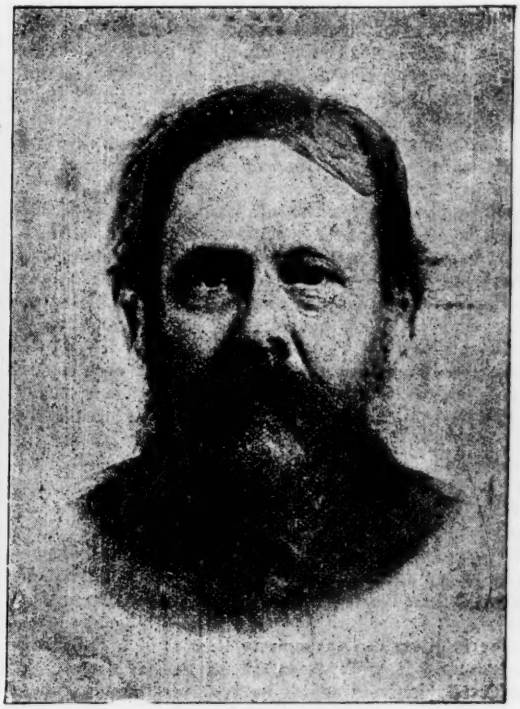


FIG. 2.—SIXTEEN NATURALISTS.

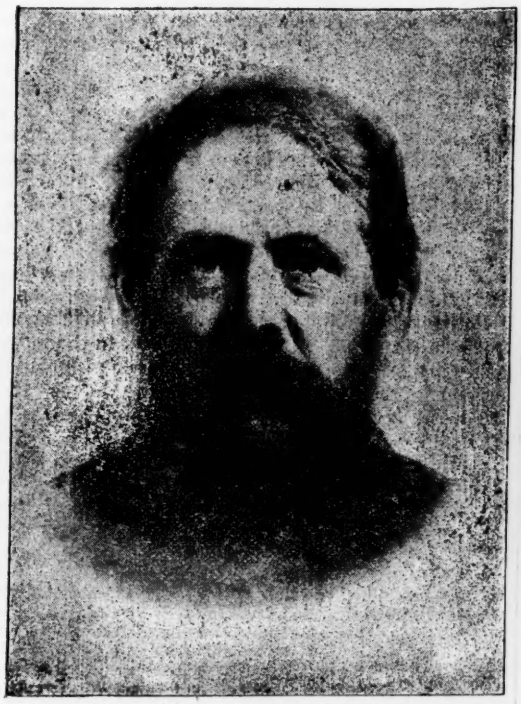


FIG. 3.—THIRTY-ONE ACADEMICIANS.

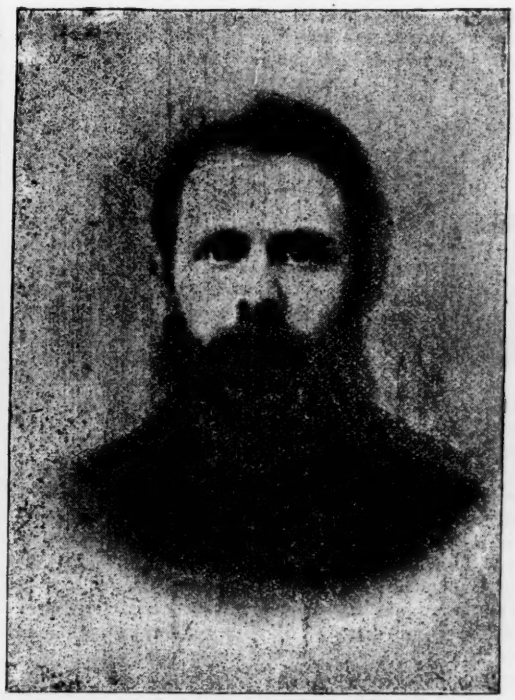


FIG. 4.—TWENTY-SIX FIELD-GEOLOGISTS, TOPOGRAPHERS, &C.

COMPOSITE PORTRAITS OF AMERICAN SCIENTIFIC MEN

than the academicians entering into this composite. They are a group selected as a type of the higher American intelligence in the field of abstract science, all but one or two being of American birth, and nearly all being of American ancestry for several generations. The faces give to me an idea of perfect equilibrium, of marked intelligence, and, what must be inseparable from the latter in a scientific investigator, of imaginativeness. The expression of absolute repose is doubtless due to the complete neutrality of the portraits.

"Fig. 3 contains eighteen naturalists and thirteen mathematicians, whose average age is about 52 years. Fig. 1 contains twelve mathematicians, including both astronomers and physicists, whose average age is about 51⅔ years. Fig. 2 is a composite of sixteen naturalists, including seven biologists, three chemists, and six geologists, with an average age of about 52½ years.

"I may mention, as perhaps only a remarkable coincidence, that the positives of the mathematicians, and also of the thirty-one academicians, suggested to me at once forcibly the face of a member of the Academy who belongs to a family of mathematicians, but who happened not to be among the sitters for the composite. In the prints this resemblance is less strong, but in these it was observed quite independently by many members of the Academy. So, also, in the positive of the naturalists, the face suggested, also quite independently to myself and many others, was that of a very eminent naturalist, deceased several years before the sitting for this composite.

"There is given also a composite (fig. 4) of a differently selected group. It is of twenty-six members of the corps of the northern transcontinental survey—an organisation of which I had charge, and the object of which was an economic survey of the North-Western Territories. It was a corps of men carefully selected as thoroughly trained in their respective departments of applied geology, topography, and chemistry, and having the physique and energy, as well as intelligence, needed to execute such a task in face of many obstacles. The average age of this group was 30 years."

DRAWING ELLIPSES.

THERE are many ways of drawing ellipses, from the wretched way commonly described as a good way (the string-and-pin method) to very complicated though very exact methods. Perhaps there is no way much simpler than that illustrated in the figure on page 291 (fig. 1). It needs no explanation. Two equal series of equidistant circles are described around each focus, and the intersections of the successive circles (taken increasingly) of one set, with the successive circles (taken decreasingly) of the other set, give an ellipse. To determine an ellipse having given foci, and a given minor axis, one has only to take that particular ellipse, of several given by the construction, which passes through the ends of the desired minor axis. (Or the major axis, if we prefer it, may be used to determine the ellipse.) Of course, it is quite easy to take the radii of our circles so that two equal circles around the foci shall intersect at extremities of any indicated minor axis, or, if we prefer it, two circles around the foci may intersect at any desired distance from either focus to determine an end of the major axis: after that taking equal divisions along the major axis, produced if necessary, we get all other radii. Fig. 2 illustrates a similar method for drawing any desired hyperbola.

Reviews.

Natural Causes and Supernatural Seemings. By HENRY MAUDSLEY, M.D. (London: Kegan Paul, Trench, & Co. 1886.) Dr. Maudsley remarks that "a really new reflection is probably as rare and doubtful an event as a new virtue, or a new vice, or a new disease." But if, in agreement with this, we abstain from speaking of his book as original, we may none the less assess it as one of the wisest and most thoughtful books of our time, and not unneeded. Its object is to examine how far the great mass of supernatural beliefs which have persisted from the lower culture till now, and which are still held by an overwhelming majority of civilised mankind, are referable to causes which were concomitant with man's mental development, and are operative still. For in the degree that these beliefs are brought under the law of causation—in other words, accounted for—they are removed from the ever-contracting area of the unexplained, and divested of their artificial importance. Dr. Maudsley submits these "seemings" to scientific inquiry, seeking for the modes of their origin and growth within the region of human experience, and narrowing them within the sphere of medical psychology. Discarding theories of revelation, spiritual illumination, and other assumed supermundane sources of knowledge, the author finds sufficing causes in the operations of the mind both in health and disease. In the one there is the defective and false reasoning due to man's long uncorrected sense-perceptions, and to the uncurbed play of imagination; in the other there are the hallucinations, visions, epidemic delusions, and other abnormal states which are the product of bodily exhaustion and unsound mental action. Then there are the ecstatic conditions which in the lives of the saints and the confessions of morbid natures are referred to the direct action of the divine on the human, but which are really the product of spasmodic nervous action or of indigestion. As Hood says of such folks, "they think they're pious when they're only bilious." The earlier chapters furnish an interesting analysis, aided by apposite illustrations, of the causes of fallacious reasoning as to supernatural existences through coincidences due to apparent answers to prayer, to fulfilment of dreams, to good or ill luck on certain days, to distorted or false observations, and also through the innate tendency of the human mind to find a supernatural cause for whatever it cannot understand, as notably illustrated in the belief in witchcraft which, supported by the authority of the Old Testament and the reasoning of distinguished doctors and jurists, lingered amongst us far into the last century. From these the author passes to the use and misuse of the imagination. That which under wholesome restraint has been the incentive and initiative of progress, of enterprise, of inquiry, of noble ideals, has, unrestricted, led the enthusiast and the dreamer into the engulfing quicksands of theories. And Dr. Maudsley, therefore, looks forward to a time when this purposeless waste shall be stopped, and the imagination, abstaining from soaring where it vainly beats the air, shall gain a hundredfold in power and in service to man "in working soberly to definite ends within the domain of sense and thought." The general lesson of the book may be gathered from this extract:—

> Not by standing out of nature in the ecstacy of a rapt and overstrained idealism of any sort, but by large and close and faithful converse with nature and human nature in all their moods, aspects, and relations, is the solid basis of fruitful ideals and the soundest mental development laid. The endeavour to stimulate and strain any mental function to an activity beyond the reach and need of a physical correlate in external nature, and to give it an independent value, is certainly an endeavour to go directly contrary to the sober and salutary method by which solid human development has taken place in the past, and is taking place in the present.

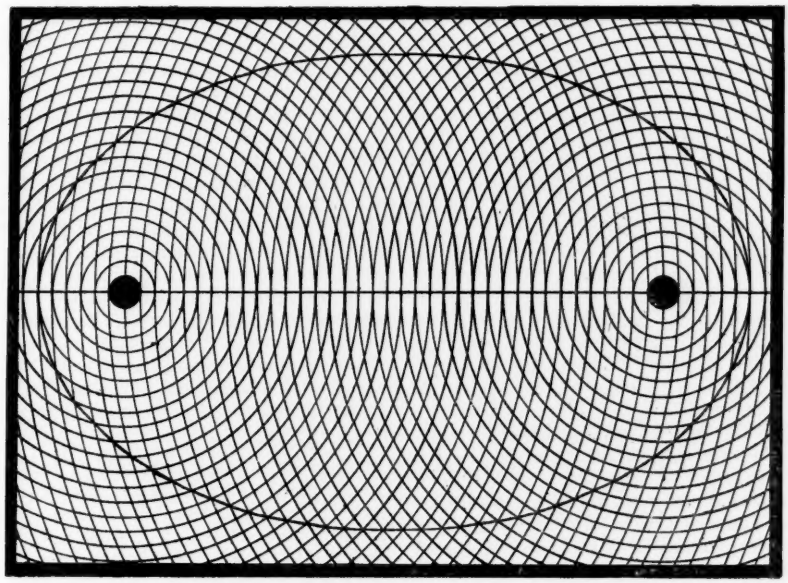


Fig. 1.—The Ellipse.

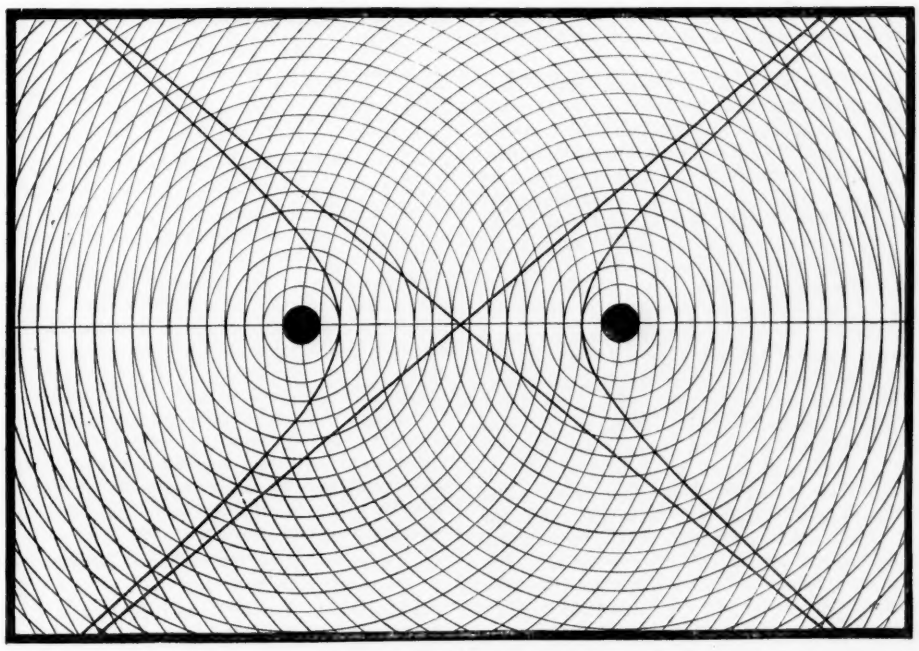


Fig. 2.—The Hyperbola.

We can only hope that this able and eloquent book may fall into the hands of persons of yet undisciplined emotional temperament. They will find its teaching a wholesome corrective to illusions the dispelling of which will set free energies, now wasted over chimeras, to be utilised for fruitful aspirations and labours.

The Larger Life: Studies in Hinton's Ethics. By CAROLINE HADDON. (London: Kegan Paul, Trench, & Co. 1886.) It is probably known to most readers of KNOWLEDGE that James Hinton was an aural surgeon of eminent skill and of high repute. He was also a metaphysician of originality, as was shown by the volume he published more than thirty years ago, under the title of "Man and his Dwelling Place." His originality consisted in going a step beyond the idealism of Berkeley and others, and asking the question, Why do we see and feel the world to be other than it is? The answer to that question was drawn from a scrutiny of human nature, intellectual and moral, and resulted in the conclusion that this misconception was due to a defect in man himself, which was the cause of a false consciousness in him. The application of that theory to moral phenomena obviously leads to an ethical philosophy unlike those built upon the opposite and common assumption. Miss Haddon, in an earlier volume, selected passages from Hinton's unpublished writings explanatory and illustrative of his views on metaphysics, religion, and ethics, which was published under the title of "Philosophy and Religion." The present volume is devoted to his ethical doctrines only. Its contents are partly selected from Hinton's works and MSS., and are partly original. Of the former, by far the most valuable are selections from letters that passed between himself and Miss Haddon. The original papers treat of the Philosophy and Ethics of James Hinton; of Utilitarianism and Atheism; of Hinton the Seer; and concludes with a few notes on Hinton's Theology. To those who know James Hinton's writings, this book is helpful as increasing their knowledge of him; to those who do not know his writings it will prove a valuable introduction to a philosophy which was at once mystical and scientific.

The Western Pacific and New Guinea. By HUGH HASTINGS ROMILLY, Deputy Commissioner for the Western Pacific. (London: John Murray. 1886.)—This book is not the result of a scamper round the globe by a tourist who wanted to tell something, but of unhurried official journeys over the fifteen millions of square miles of land and ocean embraced under the term Western Pacific, by a shrewd and kindly observer who has something to tell, and who tells it in a modest fashion, all the more graphic and effective for the lack of any varnishing of his notes. Mr. Romilly shows himself a type of representatives abroad of whom his country may be proud. He does not regard the native races as a pack of doomed and "damned niggers," who ungratefully resent the introduction of civilisation and covenanted mercies, and he enlists our sympathies with their blood-feud against the scoundrelly white traders who have scourged them with smallpox and unnameable diseases, kidnapped them on board sham missionary ships, enraged them by their rapacity, and thus counteracted the work of the missionaries, to the value of which Mr. Romilly pays hearty acknowledgment. His remark that these whites have taught the natives "to swear in a truly marvellous manner" brings to mind a statement of Dr. Livingstone's that the only art the Africans had acquired from five centuries' acquaintance with the Portuguese had been to distil spirits from a gun-barrel, and the only belief the belief that man may sell his fellow-man. Mr. Romilly saw much that is novel, both of the amusing and the terrible, in his wanderings; there is not a dull page in his book, and we close it asking, like Oliver Twist, for more, especially where hints are given of manners and customs which he indicates cannot be described in detail. How the ship's doctor astonished the natives of Solomon Islands by dexterously twisting out his false teeth, while the old chief Takki uttered thankfully a *Nunc dimittis* that he had lived to see that day; how an ingenious visitor to Fiji escaped from the cannibals by unscrewing his cork leg; how Mr. Romilly's Samoan partner at a ball despoiled him of his studs, and well-nigh of the shirt that they adorned; above all, how he had the rare, if unenvied chance, of witnessing a cannibal banquet, the details of which are as revolting as they are valuable; with all else besides concerning the superstitions and ways of life of the Melanesians generally, our readers must learn for themselves. To the anthropologist this book is indispensable; and in commending it to a wider class as a book to be bought and not borrowed, we hope that its reception may encourage the author to a further record of his travels, and more especially of the social institutions and mythologies of the islanders, crude as these may be. The scantiness of information on these subjects, together with the absence of an index, are the only drawbacks to the present work.

Six Months in Cape Colony and Natal, and One Month in Teneriffe and Madeira. By J. J. AUBERTIN. (London: Kegan Paul, Trench & Co. 1886.)—This is a record of travel of a quite different order, in a quite different and far more familiar field. A pleasant, lightly-written, gossipy book, which people intending to visit, or rather, settle at, the Cape, should put in their trunks. There is useful information about the South African industries, diamond-seeking, ostrich-farming, wine-growing, in which last the colony has much to learn; but the author has inflicted on us too much tattle of detail. That he might have stayed another night at Forest Hall; that he signed his name in the visitors' book, and that he couldn't sleep, therefore got up at 1.30 A.M., may be interesting to his immediate circle, but they are not matters that the world very much wants to know. The political discussions in the book are happily outside the serener sphere of this Journal; but the author's judgment on the Majuba business (Amajuba, meaning "many pigeons," is the correct form, Mr. Aubertin tells us) may be compared with the different judgment pronounced upon it by Mr. Froude in "Oceana." A few excellent woodcuts from photographs illustrate the text.

How to Form a Library. By H. B. WHEATLEY, F.S.A. (London: Elliot Stock. 1886.)—In this compendious and choicely-printed book one of our most accomplished bibliophiles gives the result of much mixing with his class and their possessions. The work will be found especially serviceable in the formation of public libraries, a useful feature in it being a fairly full list of books of reference, in which, by the way, under "Astronomy" Miss Clerke's recent History should be substituted for Prof. Grant's, that being out of print. We are glad to find Mr. Wheatley opposed to the "best hundred books" silly craze, for, given a few general directions, the attempt to control taste in any uniform fashion can only end in inducing mental dyspepsia. To know something of everything and everything of something was an aphorism of John Stuart Mill's that we do well to act upon; as well as to remember

> No profit grows where is no pleasure ta'en:
> In brief, sir, study what you most affect.

The Voice: Musically and Medically Considered. By ARMAND SEMPLE, Physician to the Royal Society of Musicians. (Bailliere, Tindall, & Co.)—A useful and practical recast of articles from the *Musical Standard*, the interest of which is not limited to singers, but extends to all persons subject to throat-weaknesses.

Gossip.

By Richard A. Proctor.

The article on the nebulæ in the Pleiades has been postponed till next month, owing to some delay in obtaining one of the necessary pictures.

* * *

In Munich on May 12 there was observed, in the early morning, a phenomenon which excited terrible alarm among the foolish. Heavy rain had fallen all night, and this rain had clearly brought down a quantity of sulphur. For, all round the pools and streams of standing or running water in the streets were streaks of yellow mud, of the primrose tint proper to the substance which Satan claims peculiarly as his own. The old women of both sexes, with their accustomed brilliancy, recognised the approaching end of the world in this terrible phenomenon. After smelling at the yellow mud, and finding that there was clear evidence of the devil's favourite odour, they remembered that the end of the world had been specially announced for the year 1886—for the exquisite reasons that Easter day falls later this year than it has for more than a century, and that the year both begins and ends with a Friday. A portentous number of Fridays—positively fifty-three, instead of the usual fifty-two!—a late Easter, and a fall of devil's dust ought to bring about the end of the world, at least when four comets are about and the giant planets have recently passed their perihelia, while the great pyramid has already told us of the end of all things for four years (June 1882 marked, at any rate, the end of the Christian dispensation, according to the Pyramidalists).

* * *

But, alas! there are always disappointments. Did not the comet of 1882 threaten the world's end and then go off for a thousand years or more? Did not the year 1000 pass without the world's end, naturally due then (for the devil can count up to a thousand, it seems), being brought to pass? Nay, unless the writers of the gospels, whoever they may have been, were very much deceived, very high authorities, including one who should have been the very highest, were well assured that the world's end was coming eighteen hundred years ago: yet it omitted to arrive.

* * *

And so it was this time, so far as the promise of the sulphur dust was concerned; for it changed itself into something quite different. Indeed, those wretched sceptics the students of science asserted that it never had been sulphur at all, but was simply the pollen of the fir, which this year has been so great in quantity that every wind has swept clouds of it from the great fir forests of South Germany.

* * *

It is too bad for the evil one thus to deceive those who put their trust in him and expect a sulphurous end shortly for this world. Perhaps it is because he has been a liar from the beginning, as—according to John viii. 44—was also his father before him. (Though, somehow, even the revisers have not been bold enough to translate that verse correctly which teaches that Satan had a father: of his mother our familiar sayings about "the devil and his dam" have long since taught us.)

* * *

I am inclined to suggest that vegetable dust in the air may perhaps explain the cold spells in April and May better than meteor dust. But if meteor dust at all is in question, most assuredly it is not in the wildly impossible way suggested recently in *Nature*. The editor of *Nature* has allowed his well-known dislike and contempt for mathematics to carry him too far in admitting such nonsense. Multiplication may be vexation (many fathers find it so), and division as bad (as divided households show); the rule of three (divine or otherwise) may puzzling be, and practice (as of some professing Christians) make us sad; *but* we must not multiply two by two and get five for the product.

* * *

It becomes depressing in Germany to see every day and every hour the signs of military life, and to think of what those signs really mean. The pride, pomp, and circumstance of glorious war are all very well on special occasions, though even those more splendid adjuncts of military relations become wearisome after awhile, and are always essentially unpleasing to the philosophic mind, as being a trifle too strongly suggestive of barbaric ancestry. But in military countries one sees much more of the dreary drudgery of military training and warlike preparation than of anything particularly splendid. To see this day after day, to remember that about two millions of men are always engaged thus meanly throughout Europe, and to consider what all this really means, is to be very strongly moved by the thought that "we men are a little race."

* * *

That which most men—and the human race must be judged by the majority, whatever the minority of the wiser sort might wish—that which most men regard as the finest of all the fine things men may do, is merely a gaudy remnant of savagery. The fighting qualities of mankind have been developed primarily in direct connection with plunder on an ever-growing, and therefore ever more degrading, scale. And though now the secondary relations of our fighting qualities—their defensive as compared with their offensive applications—are more considered than they used to be, yet no one can read the expressions of opinion in Continental newspapers, at any time, without feeling that the first object of all European armaments is defiance, not defence. The peoples have been so long employed by the rulers to fight for territory—to seize territory from others, and to retain it when seized—that they have inherited the imperial instinct (that is, the love of plunder and oppression), and rejoice as much in their degradation as the average monarch in grasping that which is not his own.

* * *

"Mr. Grant Allen, in his Shilling Shocking 'Kalee's Shrine'—a very striking story, by the way—has done good service in drawing attention to the dangers of what is commonly called mesmerism. He steers the true course between the folly of those who recognise the supernatural in mesmeric phenomena, and the unwisdom of those who reject those phenomena altogether. While thus helping to remove the unwholesome attraction which mesmerism, in being mysterious, possesses for weak minds, Mr. Allen effectively shows also that the effects of the perfectly natural processes by which the hypnotic condition is produced may be most mischievous.

* * *

"This may happen in two ways, on one only of which Mr. Allen insists in his story. The worst effect of mesmerism is found in a weakening of the mind brought by stupefying influence under the power of suggestions presented by another mind. There can be no doubt that a mind of average strength after being reduced many times to the hypnotic state is permanently weakened, will power is diminished, and what more serious loss can any man sustain? 'Oh, well for him whose will is strong,' says our Poet Laureate, and we all feel in our inmost hearts how

true the statement is. Happy for each one of us are those hours when our will is at its strongest. And were the truth known, the feeling we call repentance, the sorrow for wrong done or temptation not resisted, is largely due to the physical sense of weakened will. Submission, often repeated, to mesmeric influence, has as evil an effect as yielding again and again to temptations towards wrong-doing.

* * *

"ON this weakening of the will Mr. Allen does not touch, or rather his story does not turn on this observed physiological fact. But the other form of mesmeric mischief is very serious also. A person mesmerised or put into the hypnotic state is like a somnambulist. In fact, there is nothing in reality more supernatural about hypnotism than there is about somnambulism. Now, we know that somnambulists often do very strange things. They are apt to be quite different in their modes of apparent thought, and most certainly in their actions, from what they are when in full possession of their senses. The story of the somnambulist who buried suit after suit of his own clothes —and also of clothes he had borrowed—see the "Ingoldsby Legends"—is based on facts. So also are stories of somnambulists who have offended much more seriously, nay, of some who have not stopped short of murder. Now, when a mesmerist, having put his victim (I use the word advisedly) in the hypnotic state before an audience, proceeds to suggest to the hypnotised mind all manner of absurd fancies, he may not be doing any very serious harm—though, for my own part, I should as strongly object to *my* mind being set to antics, thrown as it were into the clown groove, for however short a time. But when these mesmerists go farther, as they often do, and suggest to the hypnotised mind the commission of acts which to the waking mind would be offences, the matter becomes a great deal more serious. For it has been shown that in many cases—possibly it is true in greater or less degree in all cases—the awakened mind retains something of the taint given to it while in the hypnotic condition."—*Newcastle Chronicle.*

* * *

IN the cockney conundrum of one's boyhood the question was propounded, why Neptune was like an alchemist in search of the philosopher's stone? the reply being "Because he's a sea-king what'll never be found." From a recent police report it would seem that the latest appropriator of the name of the ruler of the sea has found what he was by no means seeking in the shape of a 5*l.* fine, or twenty-one days' imprisonment in default. The *soi-disant* "Neptune" in the case to which I am referring was a certain Mr. Richard Henry Penny, who cast nativities, somewhere in the purlieus of Brunswick Square, for sums varying from five shillings to "100 shillings and upwards." He does not appear to have much to thank his stars for, since they wholly failed to forewarn him that a certain Detective-Serjeant Khurt would enter "the twelfth house" (in Grenville Street) as a quasi-pryer into futurity. Perhaps no more curious illustration of the crassitude of popular ignorance could be afforded than that to be derived from the fact that this man seems to have carried on a trade in fortune-telling lucrative enough to enable him to advertise it for at least a year past.

* * *

BUT it seems to me that in being convicted under the Act 5 Geo. IV. c. 83, s. 4, this Grenville Street "Neptune" was a little hardly dealt with. I mean, of course, though, only relatively. Surely the law is in a defective state when it punishes a man for doing openly what the authors or editors of such trash as "Zadkiel's Almanack" do anonymously. Probably for one person who was deceived by Mr. Penny, a dozen are imposed on by publications pretending to predict future events from the aspect of the heavens; and yet the latter are sold with absolute impunity, no statute in any way touching them.

* * *

THE last real astrologer is supposed to have been Morin, who quarrelled so fiercely with Gassendi when the latter abandoned astrology; and was perpetually predicting (it is needless to say quite wrongly) his opponent's death. He also fixed the date of the decease of Louis XIII., but with no better success. By-the-bye he was a fixed earth man too. But few indeed of Morin's successors have believed in their own vaticinations; in fact, if we are to stand or fall by the fundamental astrological doctrine that the whole of the events of a man's life, as well as his character, disposition, and even physique, are dependent on the aspect of the heavens at the instant of his birth, the inference is irresistible that every one born at the same time as Sir Isaac Newton must have been a consummate mathematician, of small stature, and afflicted with temporary insanity; that every man who came into the world at the same instant as Nelson must have been a born naval officer of unexampled courage and ability; and that the contemporaries in Belzoni's nativity must have all possessed the power of carrying from seven to ten men at a time with ease! The allegation has only to be stated and illustrated thus nakedly for its childish absurdity to be seen at once, and yet there are fools enough left in the world to make astrology a paying business.

* * *

ANOTHER popular superstition seems in a fair way of coming to grief. There is no vulgar error more common than that which connects the appearance of a comet with a supposed rise in terrestrial temperature; and "Comet Years" in connection with wine have become almost proverbial. The faith in this imaginary correspondence must be more robust, though, than I take it to be, if it survives the fact that no less than five comets have been visible in the sky during the present year, and that, as I write, the North Atlantic is crowded with icebergs!

THE FACE OF THE SKY FOR JULY.

BY F.R.A.S.

AS the period of solar activity continues, the student should daily examine the sun for the spots and faculæ which (in, however, somewhat diminished numbers) continue to appear. The night sky will be found delineated in map vii. of "The Stars in their Seasons." Up to July 21 twilight will persist from sunset to sunrise throughout the United Kingdom. Mercury is an evening star during the entire month. He may be caught with the naked eye after sunset by the keen-sighted observer, twinkling over the WNW. horizon early in July, and just to the N. of W. during the last part of the month. He attains his greatest elongation east of the sun (26°·52′) on the morning of the 19th. He will be about 3° south of Regulus ("The Seasons Pictured," plate xxiv.) on the 27th. Venus is a morning star, and may be seen in the ENE. between 1 and 2 A.M. She is an uninteresting telescopic object, though, now; an observation which applies, *à fortiori*, to Mars, who now appears after dusk merely as a big red star in the West. Jupiter must be looked for as soon as possible after sunset to be observed at all, as he is getting, like Mars, so rapidly towards the West. During the time that he remains visible he is travelling towards η Virginis ("The Seasons Pictured," plate xxv.). The only phenomena of his satellites certainly visible occur on July 6, when Satellite III. will leave the planet's disc at 9h. 40m. P.M.; on the 11th, when Satellite I. will exhibit the same phenomenon at 9h. 47m. P.M.; and on the 18th, when Satellite I. will enter on to the face of Jupiter at 9h. 28m. P.M. Saturn has gone for the season, as has Neptune, but Uranus

may still possibly be caught somewhat to the south of η Virginis ("The Seasons Pictured," plate xxv.). The moon is new at 10h. 6·6m. on the night of the 1st, and enters her first quarter at 1h. 18·2m. P.M. on the 8th. She is full at 3h. 8·9m. A.M. on the 16th, enters her last quarter at 7h. 21·4m. in the morning of the 24th, and will be new for the second time in July at 5h. 25·8m. A.M. on the 31st. The major part of the occultations of stars by the moon this month happen between 3 and 4 A.M., so that we do not propose to refer to them here. The only two occurring at even moderately convenient hours for the amateur are that of μ Ceti on the 24th, which will be occulted as it is rising at 11h. 32m. P.M. at the bright limb of the moon. It may be seen to reappear at the moon's dark limb afterwards, though, at 12h. 24m. at an angle of 267° from her vertex: and that of 85 Tauri on the 26th, which will be behind the moon when she rises, but, as in the previous case, may be seen to emerge from behind the dark limb of the moon 49 minutes after midnight, at a vertical angle of 224°. When these notes begin the moon is on the confines of Orion and Gemini ("The Seasons Pictured," plate xxiv.). She is travelling through Gemini until about 12h. 30m. on the night of the 2nd, when she enters Cancer. Her passage through the last-named constellation occupies her until 10h. 30m. A.M. on the 4th. At the hour just named she passes into Leo. Here she continues until 9 P.M. on the 6th, when she crosses the boundary into Virgo ("The Seasons Pictured," pl. xxv.). She is travelling through Virgo until 10 P.M. on the 9th. At that hour she enters Libra ("The Seasons Pictured," plate xxvi.), and, passing across it, arrives at 8.30 P.M. on the 11th at the boundary of the narrow northern strip of Scorpio. By 6 o'clock the next morning she has crossed this and emerged in Ophiuchus. At 3 A.M. on the 14th she passes out of Ophiuchus into Sagittarius; which at 3 P.M. on the 16th she leaves in turn for Capricornus ("The Seasons Pictured," plate xxi.). Her path across Capricornus is completed by 2 P.M. on the 17th, when she quits it for Aquarius. She is travelling through Aquarius until 9 P.M. on the 20th, and then she enters Pisces ("The Seasons Pictured," plate xxii.). At 2 A.M. on the 24th she leaves Pisces for the little corner of Cetus running between Pisces and Aries, and it occupies her until 4 o'clock in the afternoon of the same day to traverse this and pass into Aries ("The Seasons Pictured," plate xxiii.). The journey through Aries is completed by 7 P.M. on the 25th, and she then enters Taurus. In her passage through the last-named constellation she arrives, at 10 A.M. on the 28th at the boundary of the narrow northern prolongation of Orion. By 9 P.M. she has crossed this and emerged in Gemini ("The Seasons Pictured," plate xxiv.). Her path through Gemini is not completed until 11 A.M. on the 30th, at which hour she crosses into Cancer. Finally, at 8 P.M. on the 31st, she leaves Cancer for Leo, which constellation she is traversing when our notes terminate

Our Whist Column.

BY "FIVE OF CLUBS."

THE following game was played recently at Munich, I holding hand *B*. There is nothing remarkable about the play, but it illustrates well the disadvantage often arising from signalling. There can be little doubt that had not *Z*, by signalling, shown the almost hopeless position in which *A* and I stood, I should not have been driven to adopt, as the only chance of success, the apparently wild course of trumping my partner's best Diamond in order to get an extra trick by the cross-ruff. I may remark, however, that a little practice at double dummy play will convince the whist learner that devices such as these are often most useful.

THE HANDS.

B { S (*trumps*).—10, 5, 3. D.—K, Kn. / H.—A, K, 8, 7. C.—10, 8, 7, 6. }

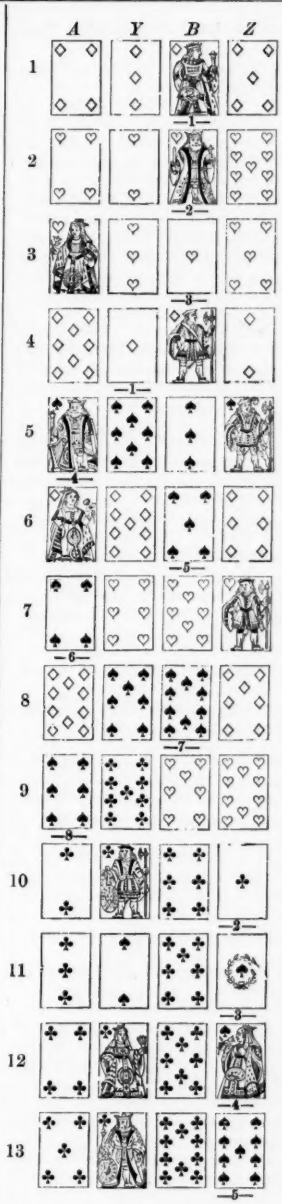
Y { S (*trumps*).—8, 7, 2. / H.—6, 3, 2. / D.—A, 9, 3. / C.—K, Q, Kn, 9. }

	B	
Y		Z
	Tr. S. Q.	
	A leads.	

{ 9, Kn, Q, A.—S.(*tps*). / 5, 9, 10, Kn.—H. / 2, 5, 6, 7.—D. / A.—C. } *Z*

A { S (*trumps*).—K, 6, 4. D.—Q, 10, 8, 4. / H.—Q, 4. C.—5, 4, 3, 2. }

SCORE:—*A-B*, 3. *Y-Z*, 3.



NOTES.

Card underlined wins trick, card below being next lead.

1. *Z* begins a signal. Seeing that he holds the necessary two by honours in his hand he should have played a more cautious game In any case, however, his hand was not one to signal from, despite the trump strength.

2, 3. *Z* signals in hearts. *A* has no more of the suit.

4. *B* does not force his partner, preferring to try for a cross ruff Leading the Knave, instead of playing it to his partner's lead (after a ruff), he conceals the chance of a cross-ruff, on which he sees that the only hope of success may depend. A single ruff at this stage is likely to be of little use if *Z* has signalled with sufficient reason.

5. *Y* responds to the signal with his best trump—another unfortunate result of *Z*'s undue forwardness.

6. *B* here pursues the strategic policy initiated at trick 4. He sees that if *A*'s Queen makes, and he himself gets only one ruff, he can give *A* only one, making with that won by the Queen only three, whereas four are wanted to save the game after trick 5. Now, the chances are very small that a fourth trick can be made in Clubs or trumps, for *Z* certainly holds the Ace of trumps, and presumably all the strength in Clubs lies between *Y* and *Z*. But besides this, nothing can be lost by trumping the Diamond Queen, for not one of *B*'s small trumps can make a trick except by ruffing, and not more than two anyhow.

7, 8, 9. The cross-ruff comes off, *Y*'s unfortunate weakness in trumps not permitting him to overtrump *A*'s Spade 6.

10, 11, 12, 13. In this order the remaining tricks would doubtless have been played had the game stood otherwise than at "love all." But of course the cards were thrown up after trick 9.

Our Chess Column.

BY "MEPHISTO."

CHESS-PLAYERS, DEAD AND LIVING.

SELF-INTEREST and every other form of egotism has been, and will always remain, the prime motor of human or animal life, in spite of anything moralists, in disregard of nature's teaching, may assert to the contrary. Thus, when a certain chess-player appeared in England, who successfully competed with the native players, he at once arrayed the self-interest of others against himself. A vague, baseless, and ungenerous kind of national egotism also came into operation against the alien. Up to the time of his arrival all work on the chess press had been considered as the hereditary property of a privileged few, who grouped them-

selves around the late Howard Staunton, jealously guarding their privileged position against the foreign intruder.

Our foreigner, although he was not an Anarchist like his countryman Most, was, nevertheless a thorough Democrat, who would acknowledge no hereditary rights of any kind, and wished to have an equal chance of competing with the favoured few for the sinecures (?) in the chess press. But, like many other Democrats, our great chess-player did not realise the fallacy of his particular belief. He failed to see that what he considered an undue privilege was only the formal recognition in that position, by consent, of those who had proved themselves the strongest and fittest, in a very long and severe contest. He forgot that when the possessors of these privileges failed to represent the implied corresponding superiority, the bastions and towers of their privileged fastness would fall, as did the walls of Jericho, but not in consequence of furious blasts from democratic trumpets, but by reason of their own weakness and decay.

Equal chance of competition, forsooth! Said the wolf to the lamb, "May the best of us win." Our chess-player soon made his influence felt in the chess press. What wonder, then, that the multitude of lambs combined against the wolf? Self-interest bade the clique of chess scribes oppose the intruding chess Hercules.

Lest some unkindly reader should accuse me of being a cynic, I hasten to say that I have a considerable amount of confidence in the generosity and benevolence of mankind; and although I must uphold my opening statement, I will gladly admit, that an appeal to, and trustful reliance in these qualities, will mostly subdue the baser instincts of human nature. Like produces like. Our foreign chess-player, unfortunately, was not nurtured in the sunshine of affection, nor did he always know contentment, though living in the land of plenty. What wonder, then, that in the struggle for supremacy, he sometimes displayed a slight acerbity, together with a too pronounced, but in his circumstances a very natural desire, to win from his opponents, and to accumulate too eagerly sundry small advantages. Needless to relate, these qualities did not appease the chess editorial lambs. On the contrary, I am grieved to say that our foreign chess-player met with but little charity.

The just tribute to his prowess as a player was often denied to him, causing an inordinate jealousy on his part to preserve his great fame. Espying this sensitiveness of the man, some of his critics deftly started a controversy calculated to wound his susceptibilities. They declared that Morphy was the greatest chess-player that ever lived—stronger than any that survived him. Our great chess-player, with a short-sightedness most curious, fell an easy prey to the enemy's tactics. He took up the challenge with avidity; thereby furnishing to everyone who chose to avail himself of the undue advantage, a ready weapon with which to inflict pain upon him. Moreover, he laid himself seriously open to the charge of egotism. He vainly believed that he would add lustre to his meritorious and great achievements as a chess-player, by belittling the play of his supposed rival.

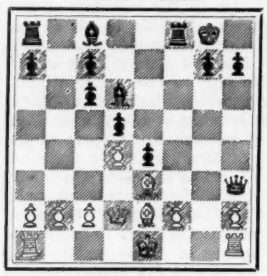
This tactical error is all the more deplorable, because any logical person will at once admit, that there cannot be any common basis of comparison between a dead man and a living player; there could be no question of measuring strength between Morphy, then a mere youth of twenty-two, and a player of more than double that age, who had before him the example of Morphy's games, as well as the experience of a whole generation of players, to guide his play, and who, above all things, has himself enjoyed constant practice for twenty-five years. It was unfair to the dead player to maintain his play was weak, for was it not the best play of his time? It would be equally unfair to the living player to say—not without some show of reason—that if Morphy could have lived he might have eclipsed any one else. Who can tell? who has a right to base an opinion affecting any person upon a mere assumption? No, there is no common basis for such a comparison, as all the required logical conditions are wanting.

There is, however, one quality in both players, which may lead to comparisons, although in my opinion comparisons are odious. My excuse however for instituting such a comparison is, that the living player himself lately gave undue prominence to this theme. We may reasonably ask ourselves, when studying the play of both these great masters, which games inspire us with most admiration for the chess genius pure and simple, as distinguished from learned ability and strength acquired by perseverance and practice.

I will put all the enthusiasm I am capable of in my reply. Great as is the genius for the game displayed by the living player, it is surpassed in the games of Morphy, who is wrongly looked upon by his great successor as a rival in fame. Morphy was a phenomenal player, the like of whom had never been seen before. The play of the living player is well known; but by giving a few examples of Morphy's style, taken at random, the reader, by refreshing his admiration for brilliant play, will, I hope, all the more readily agree with my conclusions about chess-players, dead and living.

Position in a game between Morphy and Bird after White's seventeenth move.

MORPHY—Black.



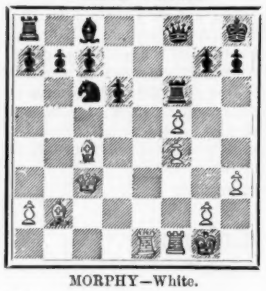
BIRD—White.

Black continued with

	R to Kt sq
17. Castles (QR)	R × BP !
18. B × R	Q to QR6 ! !
19. P to B3	Q × RP
20. P to Kt4	Q to R8(ch)
21. K to B2	Q to R5(ch)
22. K to Kt2	B × KtP
23. P × B	R × P (ch)
24. Q × R	Q × Q (ch)
25. K to B2	P to K6
26. B × P	B to B4(ch) and wins.

Position in a Game between Morphy and an Amateur after Black's twentieth move.

AMATEUR—Black.



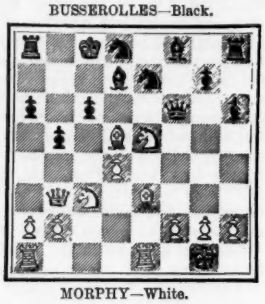
MORPHY—White.

White played

21. R to K8	Q × R
22. Q × R !	Q to K2
23. Q × P (ch)	Q × Q
24. P to B6 and wins.	

Position after Black's nineteenth move in a game played between Morphy and Busserolles.

BUSSEROLLES—Black.



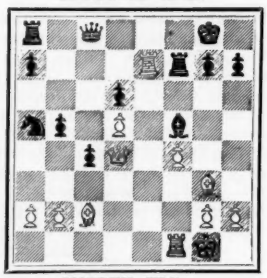
MORPHY—White.

White continued with

20. Kt to K4	Q to R5
21. P to Kt3	Q to R4
22. Kt to Q6 (ch)	K to B2
23. B to B3	Q to R6
24. QR to B sq.	K × Kt
25. B to B4	B to K3
26. Kt to Q3 (ch)	K to Q2
27. R × B	Kt × R
28. B to Kt4	Resigns.

Position in a game between Morphy and Delannoy.

DELANNOY—Black.



MORPHY—White.

White continued with

19. KR to K sq	B × B
20. R × R	K × R
21. R to K7 (ch)	K × R
22. Q × P (ch)	K to K sq.
23. Q to Kt8 (ch)	K to K2
24. B to R4 (ch)	K to Q2
25. Q to B7.	Mate.

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